DEVI AHILYA VISHWAVIDYALAYA, INDORE
SCHOOL OF PHARMACY
SYLLABUS: Ph.D. COURSE WORK (PHARMACY)

Course	Title	Credits
Course-I	Research Methodology	4
Course-II	Review of Published Research in Pharmacy	3
Course-III	Computer Application	3
Course-IV	Research Methodology in Pharmacy	3
Course-V	Research and Publication Ethics	2
-	Comprehensive Viva-voce	3
	Total Credits	**18**

Course-I: Research Methodology

Objective: To gain knowledge in general about research, its methodologies and common tools and techniques adopted for pursuing research.	
Unit-I	Introduction to research, formal science and empirical science, scientific research, research types, research design process, errors in research, formulation of research problem;
Unit-II	Hypothesis, hypothesis generation, null and alternate hypothesis, hypothesis testing, data collection; Primary and secondary data, measurement of scales nominal, ordinal, ratio, interval and Sampling
Unit-III	Introduction, nature and purpose of research ethics, ethical norms, research misconduct, conflict of interest, plagiarism.
Unit-IV	Measures of central tendency and dispersion, probability distribution, test of significance, parametric test and non-parametric test (F-test, t-test, chi-square test, sign test, Wilcoxon signed rank test, Spearman rank correlation), analysis of variance, correlation and regression.
Unit-V	Research paper and thesis writing steps and process. Research paper. Presentation-oral and poster.

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Course-II: Review of Published Research in Pharmacy

The course on Review of Published Research in Pharmacy will be undertaken under the supervisor or the regular teacher of the center of course work and the candidate must consult the library or other resources to carry out the literature review. At the end of the semester the candidate must submit a brief report on the literature review for evaluation, which will be done by the two examiners.

Course-III: Computer Application

Objective: To gain knowledge and practical experience about the use of various computer software and statistical tools for application in research work.	
Unit-I	**MS word**: Features and applications related to presentations of text in suitable format and saving the data for future applications.
Unit-II	**MS-Excel**: Construction of power point presentation from the experimental data. Design and application of formulae for calculation and their applications to the experimental data. Use of statistical tools in preparation of graphs, histograms, charts and diagrams. Use of various presentation techniques.
Unit-III	**MS Power Point**: Preparation of power point presentations based on topic of research. Insertion of figures, graphs, charts in presentation. Preparation of scientific posters for presentation. Use of various presentation techniques.
Unit-IV	**Use of SPSS& Internet Application:** Method of preparation of data sheets and entering the data according to its characteristics. Use of various statistical tools on SPSS. Overview of networking. Internet and its applications. Exploring various websites and search engines for collecting quality literature and secondary data related to research work.

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Unit-V	**Bioinformatics:** What is bioinformatics and its relation with molecular biology. Examples of related tools (FASTA, BLAST, RASMOL), Databases (GENBANK, Pubmed, PDB) and software (RASMOL, Ligand Explorer). Introduction to sequences alignment; Local alignment and Global alignment, Phylogenetic analysis.

Course-IV: Research Methodology in Pharmacy

Objective: To gain knowledge and practical experience about various Methodologies commonly employed in research filed of pharmacy.	
Unit-I	Development and validation of analytical methods based on UV, HPLC and HPTLC.
Unit-II	Introduction of systematic approaches for isolation, identification, and structure elucidation of unknown impurities. Synthesis, purification, standardization, and quantification of impurities of active drug substances. Designing and optimization of different routes for synthesis of impurities. Case studies for impurity identification and structure elucidation
Unit-III	Principle, instrumentation, working and application of Differential scanning calorimetry, Transmission electron microscopy, Scanning electron microscopy
Unit-IV	Purification of solvents and compounds, Extraction and isolation of phytoconstituents.
Unit-V	Animals used in research, limitations of animal tests, CPCSEA guidelines for performing experiments on animals, anesthetics used in laboratory animals, anatomical specifications, advantage and limitations of various anatomical sites of blood collection in laboratory animals, maintenance and breeding of laboratory animals, protocol development for animal experimentation, transgenic animals.

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Course-V: RESEARCH & PUBLICATION ETHICS

Objective: To gain knowledge and practical experience about philosophy of science and ethics, research integrity, publication ethics, research misconduct, predatory publications, indexing, citation data base and plagiarism.		
Unit-I (RPE-01)	**Philosophy and Ethics**	
	1.	Introduction to philosophy: Definition, nature and scope, concept, branches
	2.	Ethics: Definition, moral philosophy, nature of moral judgements and reactions
Unit-II (RPE-02)	**Scientific conduct**	
	1.	Ethics with respect to science and research
	2.	Intellectual honesty and research integrity
	3.	Scientific misconduct: Falsification, fabrication and plagiarism (FFP)
	4.	Redundant publications: Duplicate and overlapping publications, salami slicing
	5.	Selective reporting and misrepresentation of data
Unit-III (RPE-03)	**Publication Ethics**	
	1.	Publication ethics; Definition, introduction and importance
	2.	Best practices/standards setting initiatives and guidelines: COPE, WAME etc.
	3.	Conflict of interest

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	4.	Publication misconduct: Definition, concept, problems that lead to unethical behavior and vice versa, types
	5.	Violation of publication ethics, authorship and contributions
	6.	Identification of publication misconduct, complaints and appeals
	7.	Predatory publishers and journals
Unit-IV (RPE-04)	**Open access publishing**	
	1.	Open access publications and initiatives
	2.	SHEPRA/RoMEO online resources to check publisher copyright and self-archiving policies
	3.	Software tool to identify predatory publications developed by SPPU
	4.	Journal finder/Journal suggestion tools viz. JANE, Elsevier Journal Finder, Springer Journal suggestions etc.
Unit-V (RPE-05)	**Publication Misconduct**	
	A.	Group Discussion 1. Subject specific ethical issues, FFP, authorship 2. Conflict of interest 3. Complaints and appeals: Examples and fraud from India and abroad
	B.	Software tools Use of plagiarism software like Turnitin, Urkund and other open sources software tools

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Unit-VI (RPE-06)	**Databases and Research Metrics**	
	A.	Databases 1. Indexing databases 2. Citation databases: Web of Science, Scopus etc.
	B.	Research Metrics 1. Impact factor of journal as per Journal Citation Reports, SNIP, SJR, IPP, Cite score 2. Metrics-h-index, g-index, i10 index, altmetrics
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Comprehensive Viva-Voce

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