SYLLABUS FOR Ph.D. COURSE WORK (LIFE SCIENCES)

COURSE	TITLE	CREDITS
Course – I	Research Methodology	5
Course - II	Computer Applications	3
Course - III	Review of Literature	3
	Comprehensive viva	4

COURSE – I- RESEARCH METHODOLOGY

Objective: To gain theoretical knowledge and practical experience about various methodologies commonly employed in research field of Life Sciences.

Units- I Aseptic methods	Preparation and sterilization of solid and liquid culture media. Techniques of plant tissue and cell culture : Explant culture, anther and pollen culture, protoplast culture and protoplast fusion. Sources of type strains of microorganisms. Revival of cultures from lyophilized ampoules. Preservation and maintenance of microbial cultures. Fermentation: Submerged and solid state fermentations. Design of a typical laboratory fermentor.
Unit – II Analytical methods	Chromatography: Principle, design and applications of TLC, GC and HPLC. Electrophoresis: Agarose and Polyacrylamide Gel Electrophoresis (PAGE,SDS PAGE) Centrifugation: Types of rotors, Ultracentrifugation. Spectroscopy: Basic principles and applications of UV-Visible spectrophotometry and Spectrofluorophotometry. Chl *a* induction and kinetic measurement. Various assay procedures: Bioassay, hormone assay by RIA and ELISA. Safety evaluation of a drug/compound.
Unit – III Methods in Physiology	Terrestrial and extra-terrestrial solar radiations Action and absorption spectra, Photobiological responses and photoreceptors. Artificial and natural light sources, Spectrograph and monochromatic radiation sources. Measurement of light and quantification of response. Responses induced by phytochrome, cryptochrome and UV-B photoreceptors Inter relationship between light and growth hormones. *Basic principles and Management of laboratory animals*: Experimental design for pre-clinical studies; *In vivo* and *in vitro* methods, Administration of drugs by different methods, Collection of blood and tissue samples, Different surgical techniques. Methods for animal behavior and bio-rhythm studies.
Unit – IV Immunological methods	Production of antibodies from laboratory animals. Monoclonal antibodies. Western blot and methods of band detection. Isolation of various immune cells and their functional assays. Proteomics, methods and applications.
Unit – V Methods in Molecular biology	Isolation, purification and separation of nucleic acids. Hybridization techniques- Southern and Northern Blotting, Polymerase chain reaction and its applications, DNA sequencing methods (Sangar, Maxam & Gilbert). Microarray, RT PCR.

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COURSE – II- COMPUTER APPLICATIONS **Objective: To gain theoretical knowledge and practical experience about the use of various Computer software and statistical tools for application in research work**	
Units- I: **MS WORD**	Features and applications related to presentation of text in suitable format and saving the data for future applications. Practical knowledge of MS Word to type the script, insert tables, figures and graphs to prepare thesis and research papers in presentable format.
Unit – II **MS EXCEL**	Construction of spreadsheets from the experimental data. Design and application of formulae for calculations and their applications to the experimental data. Use of statistical tools, preparation of graphs, histograms, charts and diagrams.
Unit – III **MS POWER POINT**	Preparation of power point presentations based on the topic of research. Insertion of figures, graphs, charts in presentation. Preparation of scientific posters for presentations. Use of various presentation techniques.
Unit – IV **USE OF SPSS & INTERNET APPLICATIONS**	Method of preparing 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.
Unit -V **STATISTICAL TOOLS**	Measures of Central tendency and Dispersion. Probability distribution- Normal, Binomial and Poisson distribution. Parametric and Non-parametric statistics. Confidence interval, Errors. Quantitative Techniques: Levels of significance, Regression and Correlation coefficient. Use of Computers in Quantitative analysis.

COURSE – III- REVIEW OF LITERATURE

Objectives: To collect the available literature in the chosen field of research, preparation of chronological order about the development of various sub-topics in the field, identification of gaps in the knowledge and preparation of objectives to bridge those gaps.

Sources of research material, literature survey, compiling records.
Kinds of scientific documents – research paper, review paper, book reviews, theses, and conference and project reports.

Components of a research paper– the IMRAD system, title, authors and addresses, abstract, acknowledgements, references, tables and illustrations.

Dealing with publishers – submission of manuscript and ordering reprints.
Oral and poster presentation of research papers in conferences/symposia.

Preparation and submission of research project proposals to funding agencies.

To develop communication skills for presentation of research findings.

To understand and follow ethical issues in research.

Respective supervisors will evaluate literature review submitted by the student and recommend the topic for registration. The supervisor will also help in developing communication skills and address ethical issues in research.

COMPREHENSIVE VIVA: As per the provisions of Ordinance 31, a student will appear for comprehensive viva.