

# **Veer Bahadur Singh Purvanchal University, Jaunpur U.P.**

Syllabus of Pre-Ph.D. course work as per NEP-2020

Guidelines with effect from **academic session 2022-23**

## **Subject: Entomology**



**Dr S P N Singh (Retd)**  
Department of Entomology  
R P C A U Pusa, Bihar

**External Expert**

**Dr Akhilesh Tripathi**  
Head  
Department of Entomology  
K.A P.G College Prayagraj

**External Expert**

**Dr Shrish Singh**  
Dean  
Faculty of Agriculture  
V.B.S.P.U, Jaunpur

**Convenor**

# **Veer Bahadur Singh Purvanchal University, Jaunpur U.P.**

Syllabus of Pre-Ph.D. course work as per NEP-2020 guidelines with effect from **academic session 2022-23**

**Subject prerequisites:** Comprehensive studies on Entomology as a subject matter for the award of Ph.D. degree

**Programme outcomes (POs):** After completion of the Ph. D. degree learners will be able to understand the insight in Entomology, its importance and scope at national and world level. They may also be expected to plan and execute independent research, formulate course curriculum in various sub-disciplines of Entomology, make plan/project for the development and advancement of Agricultural Entomological industry for the welfare of mankind in general.

**PO1:** Students will be able to understand fundamentals of Entomology, its sub-discipline, nutraceutical value of Applied Entomological aspects, Phylogenetics, Classification and Molecular methods, Physiology, Distribution and Abundance of insects, Economic importance of Beneficial products, insect-plant interactions get acquired with biodiversity and conservation and Integrated pest management.

**PO2:** Students will be able to establish Agricultural entomology and applied entomology as a business and guide people to adopt Economic Entomology at large. Develop suitable package of practices for the prevention of post harvest losses. They may also be able to deliver recent Agricultural technologies to the stakeholders.

**PO3:** Learners would be able plan and execute independent research for the innovation of new technologies. They may also able to write technical papers, articles news reports and guide .Younger generation in this regard. They may also have insight in various aspects of intellectualproperty rights.

**Programme Specific Outcomes (PSOs):** Fundamentals of Entomology & Advances in Entomological technology.

**PSO1:** Students will be able to thoroughly understand the basics of Entomology and Molecular Entomology and Applied Entomology.

**PSO2:** Students will understand various production technologies of Field and Stored grain, crops (Fruits, vegetables, spices, cereals, millets, sugarcane, cotton and oilseed pant etc).

**PSO3:** Post harvest management and value addition in above Integrated Pest Management.

List of all papers of Pre-Ph.D. course work or Post graduate diploma in Research (PGDR)

| Year | Sem  | Course Code | Course Title  | Theory/Research | Credit | Max. Marks              |
|------|------|-------------|---|-----------------|--------|-------------------------|
| 7    | XIII | D051301T    | Fundamentals of Entomology and Economic Entomology                          | Theory          | 6      | 100<br>[25(CIE)+75(UE)] |
|      |      | D051302T    | Advanced Integrated Pest Management   | Theory          | 6      | 100<br>[25(CIE)+75(UE)] |
|      |      | D051303T    | Research Methodology, Research Publication Ethics and Computer Applications | Theory          | 4      | 100<br>[25(CIE)+75(UE)] |
|      |      | D051304R    | Research Project  | Research        | -      | 100<br>[25(CIE)+75(UE)] |

**Credit system:**

- A four (4) credit theory course/paper will have four lectures/periods (of one hour) in a week. There will be 60 lectures in a semester.
- Similarly, a six (6) credit theory course/paper will have six lectures/periods (of one hour) in a week. In a semester the course will be covered in 90 Lectures.

**Continuous Internal Evaluation (CIE) of 25 marks:**

- Continuous internal evaluation will be performed by the teacher/ course coordinator concerned.
- CIE shall be 25% of total assessment in a theory paper and research project.
- 25 marks shall be distributed as 5 marks for attendance, 5 marks for presentation and assignment and remaining 15 marks for class test.

**Marking system:**

- All papers will have a total maximum mark of 100, including both CIE and University Examination (UE). Maximum marks of 25 will be allotted to CIE and 75 to UE in a theory paper/ research project.
- The CIE of the research project shall be evaluated by the research supervisor and co-supervisor (if any).

- 75 marks of **research project** shall be distributed as 50 marks (project work and presentation) and a viva voce of 25 marks.
- The evaluation (Max Marks 75 UE) of the research project shall be done by internal examiner/s (Supervisor and Co-supervisor (if any)) and one external examiner appointed by the University.

### **Research Project Submission:**

- The evaluated research project report in two sets of hard copy (spiral binding) must be prepared. One copy of it shall be submitted to the university if it demands. A second copy of the evaluated research project report must be in the records of the college/research centre.
- The format of university Ph.D. thesis writing guidelines can be used as format of Research project writing guidelines.

|  |   |                       |
|--|---|-----------------------|
| <b>Programme:</b> Post graduate diploma in Research (PGDR) | <b>Year:</b> Seven (07)   | <b>Semester:</b> XIII |
| <b>Subject: Entomology</b>                                 |   |                       |
| <b>Course Code:</b> D051301T                               | <b>Course Title:</b> Fundamentals of Entomology and Economic Entomology |                       |

### **Course Outcomes ( COs)**

**CO1:** Students will be able to understand meaning scope and importance of Agricultural Entomology in national and world economy.

**CO2:** Students will have definite concept of Applied Entomology for sustainable utilization of natural resources.

**CO3:** Learners would be able to prescribe various plant growth regulators and nutritional requirement for entomological field crops.

**CO4:** Students will be able to understand the concept of agricultural entomology and scientific classification of the subject matter.

**CO5:** Students will be able to understand significance and limitations of Integrated pest management.

**CO6:** Students would be confident enough to guide agricultural entomological entrepreneurs for their profitable venture.

**CO7:** Students will be able to deal with various national problems in pesticides Industry.

**CO8:** Students will be able to boost the Insecticide production by using protected cultivation technologies.

**CO9:** Students will be able to develop improved varieties in various field crops using breeding methods, mix cropping and mix farming.

**CO10:** Learners will be able to develop suitable landscape as per requirement of the institutions /Departments.

| <b>Credits: 6</b>   |  | <b>Core Compulsory</b>        |
|---|--|-------------------------------|
| <b>Max. Marks: 25 (CIE) + 75(UE)</b>  |  | <b>Min. Passing marks: 55</b> |
| <b>Total number of lectures:</b> Lectures-Tutorial-Practical (6 hours in a week) L-T-P: 6-0-0 <b>(90 hours)</b> |  |                               |
| <b>Unit</b>   | <b>Topics</b>  | <b>No. of Lecture Hrs.</b>    |
| <b>I</b>  | Insect body wall structure, Cuticular , outgrowths, coloration, special integumentary structures in insects body tagmina, sclerites and segmentation. Head-Origin, mouthparts, tantorium, Antennae Thorax-area and sutures of tergum, sternum and pleuron, pterothorax. Structure and modification of wing and leg. Abdomen –segmentation and appendages Genitalia and metamorphosis.  | <b>15</b>                     |
| <b>II</b>   | Physiology and biochemistry of insect cuticle and moulting , Digestive system in phytophagous insect. Efficiency of digestion and absorption, Insect nutrition, physiology of Excretion, osmoregulation, physiology of insect nervous system , Endocrine system and insect hormones, physiology of insects growth and development, Metamorphosis polymorphism and dipause.   | <b>15</b>                     |
| <b>III</b>  | General account (importance, seasonal history, biology, nature of damage and symptoms) of the pests of cereals, pulses, oilseeds, fibre and stored grain pests. General account of (Seasonal history, biology, nature of damage and symptoms) the pests of vegetables, fruits, and plantation crops. A brief account of industrial Entomology (Sericulture, Apiculture, and Lac Culture). Studies of Parasites Predators, Parasitoids and Entomopathogens. Identification of different insect pests and natural enemies.   | <b>15</b>                     |
| <b>IV</b>   | To impact advanced practical knowledge of causal factors governing the distribution and abundance of insects and the evolution of ecological characteristics. Study insect-plant interaction gets acquainted with biodiversity and conservation. Indices of dispersion, Taylors power law life tables , Biogeography, Crop modelling, Roll of insect in the environment, Population genetics Hardy Weinberg law. Reproductive ecology, pest control as applied ecology.  | <b>18</b>                     |
| <b>V</b>  | Detailed study of three schools of classification- numerical, evolutionary and cladistic. Methodologies employed. Development of phenograms, cladograms, molecular approaches for the classification of organisms. Species concepts, speciation processes and evidences. Detailed study of International Code of Zoological Nomenclature, including appendices to ICZN; scientific ethics. Nomenclature and documentation protocols and procedures; report preparation on new species; deposition of holotypes, paratypes. | <b>15</b>                     |

|           |   |           |
|-----------|---|-----------|
| <b>VI</b> | Defining behavior concept of umbel, instinct, fixed action patterns, imprinting complex behavior, learnt behavior and motivation. Genetic control of behavior and behavioral Polymorphism. Orientation –Forms of primary and secondary orientation including taxes and kinesis, communication- Primary and secondary orientation responses to environmental stimuli. Reproductive behavior- mate finding, courtship, territoriality, Parental care, sexual selection, social behavior-mutualism. Behavior is IPM and pest management. | <b>12</b> |
|-----------|---|-----------|

1. Chapman RF. (1998). the Insecta : structure and function Cambridge university press Cambridge.
2. David BV and Ananthkrishnan TN (2004). Genaral and applied entomology: Tata McGraw Hill, New Delhi.
3. Dunston PA. (2004). The Insects : Structure Function and Biodivesity Kalyani Publication New Delhi.
4. Saxena RC and Srivastava RC (2007). Entomology: At a Glance Agrotech Publication Academy, Jodhpur.
5. Snodgross (1993). Principles of insect morphology: Cornell University Press Ithaca.
6. Kerkut GA and Gilbert LI (1985). Comprehensive insect Physiology, Biochemistry and Pharmacology Vols. I-XIII Pergamon Press New York.
7. Patnaik B.D.(2002). Physiology of insects dominant, New Delhi.
8. Rechards O.W. and Davies RG (1977). Imm's General Text book of Entomology , 10<sup>th</sup> ed. Vol. I Structure, Physiology and development, Chapman and Hall, New York.
9. Winglesworth V.B. (1984). Insect Physiology 8<sup>th</sup> Ed. Chapman and Hall, New York.
10. Henning W. (1960). Phylogenetic Systematics. Urbana Univ. Illinoide Press. USA.

| <b>Programme:</b> Post graduate diploma in Research (PGDR)   |  | <b>Year:</b> Seven (07)                                  | <b>Semester:</b> XIII |
|--|--|--|-----------------------|
| <b>Subject: Entomology</b>   |  |  |                       |
| <b>Course Code:</b> D051302T   |  | <b>Course Title:</b> Advances Integrated Pest management |                       |
| <b>Course Outcomes ( COs)</b>  |  |  |                       |
| <p><b>CO1:</b> Students will be able to design various package and practices for tropical, sub-tropical and temperate field crops.</p> <p><b>CO2:</b> Students will be able to design various control and practices for major and minor Field, Stored grain vegetable, fruit crops etc.</p> <p><b>CO3:</b> Learners will be able to design, aim, management, limitation and field, stored grain control for IPM.</p> <p><b>CO4:</b> Students will be able to deal with management, maintaining their population below Economic injury levels above IPM.</p> <p><b>CO5:</b> Students will be able to deal with Pre and post harvest management of above Entomology Entomology and develop suitable processing technologies.</p> |  |  |                       |
| <b>Credits: 6</b>  |  | <b>Core Compulsory</b>                                   |                       |
| <b>Max. Marks: 25 (CIE) + 75(UE)</b>   |  | <b>Min. Passing marks: 55</b>                            |                       |
| <b>Total number of lectures:</b> Lectures-Tutorial-Practical (6 hours in a week) L-T-P: 6-0-0 ( <b>90 hours</b> )  |  |  |                       |
| Unit   | Topics   |  | No. o<br>Lecture Hrs. |
| <b>I</b>   | Principles of sampling and surveillance database management and computers, Programming simulation techniques and system analysis and modelling. Genetic engineering and new technologies-their progress and limitation in IPM Programmes, scope and limitation of bio-intensive and ecological based IPM Programmes, Application of IPM to farmers, Insect pest management under Protected cultivation, strategies for pesticide resistance management. Study of histories of national and international programmes, their implementation, global trade and Criticism.   |  | <b>15</b>             |
| <b>II</b>  | Penetration and distribution of insecticides in insect system, insecticide selectivity, factors affecting toxicity of insecticides, Biochemical and Physiological target sites of insecticides in insects developments in biorationals biopesticides and newer molecules ; their modes of action advances in metabolism of insecticides, activation, synergism problems associated with pesticides use in agriculture pesticides resistance, pest resuragence and outbreaks perristance and pollution, health hazards and insecticides residues-sampling and estimation by various methods and insecticides law. |  | <b>15</b>             |

|            |  |           |
|------------|--|-----------|
| <b>III</b> | Scope of classical biological control and augmentative bio control, introduction and handling of natural enemies, nutrition of entomophagous insects and their hosts , dynamics of bio control agents vis-à-vis target pest population. Techniques of release of natural enemies and ecological manipulation bio control agents. Genetics of ideal traits in bio control agents for introgressing and for progeny selections, breeding techniques of bio-control agents.   | <b>15</b> |
| <b>IV</b>  | Elementary knowledge of Molecular Biology, techniques used in molecular biology. DNA and RNA recombinant technology. Genetic improvement of natural enemies.<br>Physical and chemical environment conferring resistance in plants, role of trypsin inhibitors and protease inhibitors in plant resistance<br>Biochemistry of induced resistance. Signal transduction path ways, methyl jasmonate path ways, polyphenol oxidase path ways and effect of induce resistance.  | <b>15</b> |
| <b>V</b>   | Importance of plant resistance, historical perspective, desirable morphological, anatomical and biochemical adaptations of resistance; assembly of plant species- gene pool; insect sources behavior in relation to host plant factors. Estimation of plant resistance based on plant damage screening and damage rating, evaluation based on insect responses: techniques and determination of categories of plant resistance; breakdown of resistance in crop varieties. | <b>18</b> |
| <b>VI</b>  | Comparative morphology of Acari, phylogeny of higher categories in mites, knowledge of commonly occurring orders and families of Acari in India. Diagnostic characteristics of commonly occurring species from families Tetranychidae, Eriophyidae, Bdellidae, Cunaxidae, Camerobiidae, Trombidiidae and Trombiculidae. Soil mites in India. Management of economical important species of mites in agriculture, veterinary and public health: storage acarology.          | <b>15</b> |



## Suggested Readings:

1. Burges HD and Hussey NW (Eds.) (1971). Microbial Control of Insect and Mites academic Press, London.
2. Coppel HC and James WM (1977). Biological Insect Pest Suppression Springer Wertag Berlin.
3. De. Bach P. (1964). Biological Control of Insect pest and weeds. Chapman and Hall, London.
4. Dhaliwal, GS and Koul O (2007). Biopesticides and Pest management, Kalyani Publication New Delhi.
5. Hayes WJ and Laws ER (1991). Handbook of Pesticides Toxicology, Academic Press New York.
6. Matsumura F. (1985). Toxicology of Insecticide. Plenum Press New York.
7. Dhaliwal GS and Arena R. (2003). Integrated Pest Management-Concepts and Approaches Kalyani Publication New Delhi .
8. Dhaliwal GS, Singh R. and Chhillar BS (2006). Essential of Agricultural Entomology Kalyani Publication, New Delhi.
9. Flint MC and Bosch RV (1981). Introduction of Integrated Pest Management Springer, Berlin.
10. Coul O, Dhaliwal GS and Curterus GW. 2004 Integrated Pest Management-Potential Constraints and Challenges. CABI, London.
11. Marodia KM, Dakouo D. and Mota-Sanchez D. (2003). Integrated Pest Management in the Global Arena CABI, London.

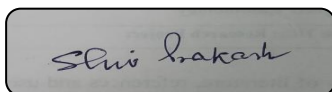
|  |  |                       |
|--|--|-----------------------|
| <b>Programme:</b> Post graduate diploma in Research (PGDR)   | <b>Year:</b> seven (07)  | <b>Semester:</b> XIII |
| <b>Subject:</b> Entomology   |  |                       |
| <b>Course Code:</b> D051303T   | <b>Course Title:</b> Research Methodology, Research Publication Ethics and Computer Applications |                       |
| <p><b>Course Outcomes ( COs)</b></p> <p><b>CO1:</b> Students will be able to decide, design &amp; execute the research plan, pros and cons in research and data collection&amp; analysis.</p> <p><b>CO2:</b> The student will be able to understand the research process and acquire the skill of writing research articles and report.</p> <p><b>CO3:</b> The course will enable the candidate to execute the best practices, morals and ethical values in scientific conduct.</p> <p><b>CO4:</b> Students will be able to learn about the standards of journals for good-quality publications.</p> <p><b>CO5:</b> After this course, the students will be able to learn how to use computers and different applications for manuscript writing.</p> <p><b>CO6:</b> This course will enable the students to learn about various methods of reference management and the maintenance of academic integrity using scientific tools.</p> |  |                       |
| <b>Credits:</b> 4  | <b>Core Compulsory</b>   |                       |

| <b>Max. Marks: 25 (CIE) + 75(UE)</b>  |   | <b>Min. Passing marks: 55</b> |
|---|---|-------------------------------|
| <b>Total number of lectures:</b> Lectures-Tutorial-Practical (4 hours in a week) L-T-P: 4-0-0 |   | <b>(60 hrs)</b>               |
| <b>Unit</b>   | <b>Topics</b>   | <b>No. of Lecture Hrs.</b>    |
| <b>I</b>  | <b>Research Methodology</b><br>Definition and Objectives, Motivation and Significance of Research, Types of Research, Truth and Facts of Research, Similarity and Contrast in Literary and Scientific Research, Research and Criticism, Research Problem and Research Design, Sampling Design and Methods of Data Collection.   | <b>12</b>                     |
| <b>II</b>   | <b>Research standards:</b><br>Layout of the Research Report, Research Process: subject Selection, Outline of the Research, Review of Literature, Material Collection; Testing and Classification, Analysis, Discussion and Conclusions, Precautions in Writing Synopsis/Research Paper/Thesis/Research Report.  | <b>12</b>                     |
| <b>III</b>  | <b>Philosophy, Ethics, Scientific Conducts and misconducts</b><br>Moral Philosophy, Nature of Moral Judgments and Reactions, Publication Ethics, Best Practices/Standards Setting Initiatives and Guidelines: Committee on Publication Ethics (COPE), World Association of Medical Editors (WAME) etc., Intellectual Honesty and Research Integrity: Falsification, Fabrication and Plagiarism (FFP), Open Access Publishing, and Publication Misconduct. | <b>08</b>                     |
| <b>IV</b>   | <b>Databases and Research Metrics</b><br>Databases: Indexing Databases, Citation Databases: Web of Science, Scopus etc., Research Metrics: Impact Factor of Journal as Per Journal Citation Report, SNIP, SJR, IPP, Cite Score;<br>Metrics: h-Index, g-Index, i-10 Index, and Altimetric.   | <b>08</b>                     |
| <b>V</b>  | <b>Fundamentals of Computers and application Softwares</b><br>Types of Computers, Computer Peripherals and internal component, Types of operating Systems, Web Browser, Web Search Engine, Spreadsheet Processing, Presentation (MS PowerPoints Preparation or Beamer or Libre Office (Optional), Project/Thesis/Report writing, Using MS-Word or LaTeX or LibreOffice documentation style Labelling, Referencing Style, Footnotes etc.                   | <b>12</b>                     |
| <b>VI</b>   | <b>Scientific Softwares</b><br>Use of Reference Management Software Like Mendeley, Zotero, Reference Manager, Endnote, Authorea Etc. Anti-Plagiarism Software Like Turnitin, iAuthenticate, Urkund, Ebooks and Virtual Library, UGC-Infonet, Computer Hazards and Security  | <b>08</b>                     |

## Suggested Readings:

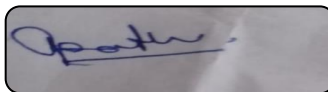
1. C.R. Kothari, *Research methodology Methods and Techniques*, 4<sup>th</sup> Edition, New Age International (P) Ltd. Publisher, 2014.
2. W. Creswell, *Research Design, Qualitative, Quantitative and mixed method approaches*, 3rd Edition, Sage Publications, Inc.
3. D.B. Resnik, (2011) What is ethics in research & Why is it important. National institute of Environmental Health Science, 1-10 Retrieved from <https://www.niehs.nih.gov/research/resources/bioethics/whatis/index.cfm>
- 4.
5. Indian National Science Academy (INSA), *Ethics in Science Education, Research and Governance*,(2019),ISBN:978-81-939482-1-7.  
[https://www.insaindia.res.in/pdf/Ethics\\_Book.pdf](https://www.insaindia.res.in/pdf/Ethics_Book.pdf)
6. Reema Thareja (2019) *Fundamentals Of Computers* (2<sup>nd</sup> Edition), Oxford University Press
7. Microsoft Office 365 : A complete Guide to Master Word, Excel, and PowerPoint 365 for Beginners, Matt Vic
8. Leslie Lamport, *LaTeX, A Document Preparation System*, 2<sup>nd</sup> Edition, Addison-Wesley Professional Publisher, July, 1994.
9. Latex tutorials <https://www.tug.org/twg/mactex/tutorials/ltxprimer-1.0.pdf>
10. Libre Office tutorial: [www.documentation.libreoffice.org/en/english-documentation](http://www.documentation.libreoffice.org/en/english-documentation)  
Suggested equivalent online courses: <https://epgp.inflibnet.ac.in/>

|   |  |                       |
|---|--|-----------------------|
| <b>Programme:</b> Post graduate diploma in Research (PGDR)  | <b>Year:</b> seven (07)                      | <b>Semester:</b> XIII |
| <b>Subject: Entomology</b>  |  |                       |
| <b>Course Code:</b> D051304R  | <b>Course Title:</b> <b>Research Project</b> |                       |
| <b>Course Outcomes (COs)</b>  |  |                       |
| CO1: Students will be able to review of literature, references and use of statistical methods for detaanalysis. |  |                       |
| CO2: Students will be able to design new research plan.   |  |                       |
| CO3:Students would be confident enough to contemplate research requirements.                                    |  |                       |
| <b>Credits: Non -Credit</b>   | <b>Core Compulsory</b>                       |                       |
| <b>Max. Marks: 25 (CIE) + 75(UE)</b>  | <b>Min. Passing marks: 55</b>                |                       |



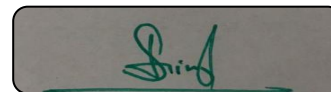
**Dr S P N Singh (Retd.)**  
Department of Entomology  
R P C A U Pusa, Bihar

**External Expert**



**Dr Akhilesh Tripathi**  
Head  
Department of Entomology  
K.A.P.G College Prayagraj.

**External Expert**



**Dr Shrish Singh**  
Dean  
Faculty of Agriculture  
V.B.S.P.U Jaunpur

**Convenor**