## SEMESTER III

## PEBCF20 - ELECTIVE III B: RESEARCH METHODOLOGY

| Year/ Sem | Course Code | Title of the Course | Course Type | Course Category | H/W | Credits | Marks |
|---|---|---|---|---|---|---|---|
| II / III | PEBCF20 | Research Methodology | Theory | Elective III B | 3 | 3 | 40+60=100 |

**Objective:**

To addresses the issues inherent in selecting a research problem and discuss the techniques and tools to be employed in completing a research project.

**Course Outcome (CO):**

On completion of the course, the students will be able to;

1. Design the research work
2. Gain an idea on the role of biostatistics in research
3. Understand the significance of internet in research
4. Develop the understanding on database management system
5. Practice the concepts of animal studies and CPCSEA guidelines in research

| CO / PO | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 |
|---|---|---|---|---|---|---|
| CO 1 | H | H | H | H | M | L |
| CO 2 | H | H | H | M | M | M |
| CO 3 | H | H | M | H | H | M |
| CO 4 | H | H | H | M | M | L |
| CO 5 | H | H | M | H | M | M |
| H- High (3), M-Medium (2), L-Low (1) | | | | | | |

| CO / PSO | PSO 1 | PSO 2 | PSO 3 | PSO 4 | PSO 5 | PSO 6 |
|---|---|---|---|---|---|---|
| CO 1 | H | H | H | H | M | H |
| CO 2 | H | H | H | M | M | M |
| CO 3 | H | H | M | M | M | M |
| CO 4 | H | H | M | M | M | L |
| CO 5 | H | H | M | H | M | M |
| H- High (3), M-Medium (2), L-Low (1) | | | | | | |

**Unit I:** **(9 Hours)**

1.1 Scientific research & writing - Importance and need for research. (K1, K2, K3, K4)

1.2 Ethics and scientific research. Formulation of hypothesis. (K1, K2, K3, K4)

1.3 Types and characteristic designing a research work. (K1, K2, K3, K4, K6)

1.4 Scientific writing - Characteristics - Logical format for writing thesis and papers. (K1, K2, K3, K4, K6)

1.5 Essential features of abstract, introduction, review of literature, materials and methods, and discussion. (K1, K2, K3, K4, K6)

1.6 Effective illustration - tables and figures. Reference styles - Harvard and Vancouver systems. (K1, K2, K3)

**Unit II: (9 Hours)**

2.1 Biostatistics - Collection and classification of data (K1, K2, K3, K4, K6)

2.2 Diagrammatic and graphic representation of data measurement of central tendency (K1, K2, K3, K4, K5, K6)

2.3 Standard deviation - normal distribution (K1, K2, K3)

2.4 Test of significance based on large samples - small samples - Student t test (K1, K2)

2.5 Correlation and regression (K1, K2)

2.6 Chi square test for independence of attributes - ANOVA. (K1, K2, K3)

**Unit III: (9 Hours)**

3.1 Bioinformatics - Introduction to bioinformatics (K1, K2, K3)

3.2 Scope of bioinformatics (K1, K2, K3, K4)

3.3 Role of computers in biology (K1, K2)

3.4 Internet - The World Wide Web. (K1, K2, K3)

3.5 Useful search engines - Boolean searching, search engine algorithms. (K1, K2, K3)

3.6 Finding scientific articles – PubMed, Science direct. (K1, K2, K3)

**Unit IV: (9 Hours)**

4.1 Databases - Data base concepts - database, database system, database management systems - hierarchical, rational and network, database security**.** (K1, K2, K3, K4)

4.2 Biological databases - types, sequence and structure. (K1, K2)

4.3 Data submission (K1, K2)

4.4 Data retrieval. (K1, K2)

4.5 Searching sequence databases - sequence similarity searches, amino acid substitution matrices. (K1, K2, K3, K4, K6)

4.6 Database search - FASTA and BLAST, CLUSTAL. (K1, K2, K3, K6)

**Unit V: (9 Hours)**

5.1 Bioethics. (K1, K2)

5.2 Ethics in animal experimentation. CPCSEA guidelines - Animal care and technical personnel environment, animal husbandry, feed, bedding, water, sanitation and cleanliness, waste disposal, anesthesia and euthanasia. (K1, K2, K3, K6)

5.3 Composition of (Human) institutional Ethical Committee (IEC) - General ethical issues. (K1, K2, K3)

5.4 Specific principles for chemical evaluation of drugs, herbal remedies and human genetics research (K1, K2, K3)

5.5 Ethics in food and drug safety. (K1, K2, K3)

5.6 Environmental release of microorganisms and genetically engineered organisms. Ethical issues in human gene therapy and human cloning. (K1, K2)

**Text Books**:


1. C R Kothari -Research Methodology- Methods and Techniques, 4th Edition., 2019.
2. Ranjit Kumar -Research methodology- Pearson education, 2005.


**Reference Books:**


1. Bryan Bergeron MD- Bioinformatics Computing- Prentice-Hall of India Pvt.Ltd, 2012.
2. Bergeron BP- Bioinformatics Computing- Printice Hall, 1st Edition, 2002.
3. John M Lachin-Biostatistical Methods- Wiley interscience, 1st Edition, 2000.
4. Ethical guidelines for biomedical research on human subjects. ICMR, New Delhi, 2000.
5. Sundar Rao, Jesudian Richard -An Introduction to Biostatistics, 5th Edition, 2012.


**Open Educational Resources (OER)**

1. https://youtu.be/3FE5ldiIp6A
2. https://youtu.be/Coe0N2xb8kk
3. https://youtu.be/Nx_E4Z4y8uQ
4. https://youtu.be/Ap3rUxB4k9Q
5. https://youtu.be/kAxTbc6nsFs