# INTERNSHIP PROGRAMME FOR UG DEGREE (SEMESTER-V)

***(For the students admitted under New Curriculum and Credit Framework from the academic session 2023-24)***

| **Course Title: Analytical Laboratory Operations and Quality Assurance** | |
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| **Internship Providing Organization (IPO):** | **Department of Microbiology, Bankura Sammilani College** |
| **Category of Course:** | **For UG DEGREE (SEM-V)** |
| **Duration:** | **60 Hours** |
| **Course Coordinator and Contact Details:** | **Mr. Sourav Singha**<br>**Mobile No: 9434484476** |
| **Mentor:** | **Dr. Arindam Ganguly** |
| **Intake Capacity:** | **70 Students** |
| **Course Fees:** | **Rs. 200/- (Students from Host Institution)**<br>**Rs. 400/- (Students from Other Institution)** |

# SYLLABUS

**Course Title: Analytical Laboratory Operations and Quality Assurance**
**[50 Marks/2 Credits/60 Hours]**

| Learning Outcomes (LOs) |
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| • Gain well knowledge about instrumentation calibration techniques and good laboratory practices.<br>• Understand the research process from problem identification to selecting appropriate research designs, including forming hypotheses.<br>• Gain practical knowledge of sampling techniques and data collection methods, tailored to undergraduate-level scientific projects.<br>• Learn to analyze and interpret data using basic statistical tools like MS Excel, SPSS, and ANOVA, along with creating graphs and visualizations.<br>• Acquire proficiency in digital tools such as MS Word, Excel, PowerPoint, and Open Office for preparing professional research documents and presentations. |

| MODULE-I (Theory) |
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| **Unit 1: Introduction of Biostatistics [12 Hours]** |
| Role and applications of statistics in microbiology, Types of data and variables, Sampling methods, Data collection and organization, Frequency distribution, Tabulation and graphical representation of data, Mean, median, and mode, Range, variance, standard deviation, Coefficient of variation. |
| **Unit 2: Analytical Problem identification & Formulation [6 Hours]** |
| Hypothesis – Qualities of a good Hypothesis –Null Hypothesis & Alternative Hypothesis, p-value and significance level, Z-test, t-test, Chi-square test |
| **Unit 3: Advanced Instrumentation and Calibration Techniques [12 Hours]** |
| Principles of analytical measurements, Components of analytical instruments- Accuracy, precision, sensitivity, selectivity, and detection limits - Instrument qualification and validation. Laboratory safety and Good Laboratory Practices (GLP), Good Manufacturing Practices (GMP), Preventive maintenance schedules for laboratory instruments, Good Documentation Practices (GDP) and laboratory compliance requirements |

| MODULE-II (Practical) |
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| **Unit 1: Computer Application in analytical work: [10 Hours]** |
| Introduction to MS Excel, Using Formulas and Functions, Features for Statistical Data Analysis, Generating Charts/Graphs, Introduction to MS Word, Features and Functions, Writing Report in MS Word, Introduction to Open Office.<br>Creating Presentations in MS Power Point. |
| **Unit 2: Data analysis tools (Software application) [6 Hours]** |
| Digital Documentation, Statistical tools (SPSS & ANOVA), Data visualization & analysis tools. Data visualization techniques (bar charts, scatter plots, box plots, histograms, heat maps). |
| **Unit 3: Calibration and Quality Control Procedures [14 Hours]** |
| Calibration and monitoring of instruments: Analytical Balance, pH Meter, Micropipettes UV-Visible Spectrophotometer, HPLC (Demonstration), GC (Demonstration), FTIR (Demonstration), AAS (Demonstration), Centrifuge, PCR Thermal Cycler, Incubator and Hot Air Oven, Autoclave, ELISA Reader, Flow Cytometer (Demonstration) |

**Reference Books**


(1) Creswell, J.W. and Creswell, J.D., 2017. Research design: Qualitative, quantitative, and mixed methods approach. Sage publications.

(2) Kothari, C.R., 2004. Research methodology: Methods and techniques. New Age International.

(3) Krishnaswamy, K.N., 2006. Management Research Methodlogy: Integration of Principles, Medthods and Techniques. Pearson Education India.

(4) Sekaran, U. and Bougie, R., 2016. Research methods for business: A skill building approach. John Wiley & Sons.