



# ICGEB

International Centre for Genetic  
Engineering and Biotechnology

## Meeting details

Type of event you request support for:	<b>Theoretical/Practical Event</b>
Indicate if this is a re-submission:	<b>No</b>
Indicate if the event will be Theoretical and/or Practical:	<b>Theoretical/Practical</b>
Event title:	<b>Training Workshop on 'Functional Metagenomics for Antimicrobial Resistance: Advancing Surveillance, and Predictive Modeling'</b>
City where the Course/meeting will be held:	<b>Islamabad</b>
Country where the Course/meeting will be held:	<b>Pakistan</b>
First day of the meeting:	<b>16/03/2026</b>
Last day of the meeting:	<b>19/03/2026</b>
Total number of working days:	<b>4</b>
Expected number of participants:	<b>40-50</b>

## Organising Institute

(in charge of the meeting organization and ICGEB grant management)

### Organising Institute data

Full Name:	<b>Commission on Science and Technology for Sustainable Development in the South (COMSATS)</b>
Full Address:	<b>COMSATS Secretariat, Shahrah-e-Jamhuriat, G-5/2, Islamabad, Pakistan</b>
Telephone number:	<b>+92519214515-7</b>



# ICGEB

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Fax number: +92519216539

## Legal representative of the Organising Institute

Name: Ambassador Dr. Mohammad Nafees Zakaria  
E-mail address: ed1122@comsats.org

## Person of the Organising Institute responsible for implementation of financial management

Name : Mr. Amanullah Khattak  
Official position: Director (Finance and Accounts)  
E-mail address: aman@comsats.org

## Administrative contact

Name: Dr. Mehwish Durani  
E-mail address: mehwish.durani@comsats.org

## Scientific Organiser

Title: Dr.  
Surname: BALOUCH  
Name(s): Huma  
Complete work address: COMSATS Secretariat, Shahrah-e-Jamhuriat, G-5/2, Islamabad, Pakistan  
Telephone number: +923345124614  
Fax number: N/A  
E-mail address: huma.blch85@gmail.com  
Enter my E-mail in the ICGEB Mailing List Yes



**Past Experience in organizing Courses/Meetings, etc:** The Scientific Officer has organized more than 65 capacity building events such as conferences/workshops/seminars/statutory bodies meetings in more than 12 countries.

The Scientific Officer has close contacts with international donor/development agencies such as UNESCO, UNIDO, UNESCAP, UNOSSC, UNFCCC, TWAS, IAP, ICESCO, ICGEB, South Centre, IsDB, IOFS etc. as well as government departments, ministries, embassies, universities and R&D organizations. Initiated and executed joint scientific and technical cooperation programmes in different areas of S&T including Natural Products Sciences; Agriculture, Food Security and Biotechnology; Climate Change and Environmental Protection; Nanotechnology; Renewable Energies; Science Diplomacy; and S&T Policy and National Innovation Systems.

The Scientific Officer has previously received grant from ICGEB (Euros 10,000) in 2024 for holding Training Workshop on "Metagenomics-based Approaches for Viral Disease Surveillance" held in Islamabad, Pakistan.

The Scientific Officer has also received grant of UNESCO (63,000 US \$ each) for biennium programme 2010-2011 (US \$ 28,000), 2021-2022 (US \$ 30,000) and organized ten capacity building workshops.

The Scientific Officer is also designated contact point from COMSATS to United Nations Climate Change Conference or Conference of the Parties of the UNFCCC and has represented COMSATS in COP27, COP29.

- Previously the Scientific Officer also organized following international major events, on behalf of COMSATS, as official global host declared by UNESCO:

- IYCr International Year of Crystallography - South Asia Summit Meeting on Vistas in Structural Chemistry in Karachi, Pakistan during April 28-30, 2014, held under the auspices of the International Union of Crystallography (IUCr) and United Nations Educational, Scientific and Cultural Organization (UNESCO);

- International Year of Light - International Symposium on 'Light and Life' on October 14, 2015 in Islamabad, Pakistan, in collaboration with The Abdus Salam International Centre for Theoretical Physics (ICTP)

Have you received previous financial support from ICGEB: **Yes**

Type of support previously received: **Euros 10,000 for ICGEB theoretical and/or practical event**



Year you received the support: **2024**  
Ref.no. of the ICGEB Course/CRP/Fellowship you received: **W/PAK24-01**

## **Co-organisers (if applicable)**

### **List of co-organisers (if any) and brief description of contribution to the meeting organization:**

- 1. Dr. Azeem Mehmood Butt**  
Associate Professor  
Translational Genomics Lab, Dept of Biosciences,  
COMSATS University Islamabad (CUI)  
+92335074282  
azeem.butt@comsats.edu.pk
- 2. Prof. Dr. M. Iqbal Choudhary**  
H.I., S.I., T.I., Mustafa (PBUH) Prize Laureate  
Coordinator General COMSTECH  
33-Constitution Avenue, G-5/2, Islamabad-44000  
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Tel: (+92 51) 9220681-3  
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- 3. Dr. Ersin Üresin**  
Coordinator of Vice Presidency of Materials Technologies  
TÜBİTAK Marmara Research Center (MAM)  
Baris Mah. Dr. Zeki Acar Cad.  
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- 4. Prof. Dr. Jibin Sun (potential)**  
Deputy Director-General  
Tianjin Institute of Industrial Biotechnology (TIB)  
Chinese Academy of Sciences (CAS)  
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- 5. Dr. Sadvakasova Asem Kalikumarovna**  
Deputy dean on scientific-innovations work  
& international links affair, candidate of biological sciences Tel:  
8(727) 377-33-34 inner.12-18  
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Initially all co-organisers (COMSATS four Centres of Excellence), have consented to collaborate for the training Workshop contributing in the form of determining the resources, materials, and learning tools/developing modules needed for the training, pre-training and post-training assessments, identifying participants, logistics, venue, and other necessary arrangements.



## Meeting Information

### Invited speakers

Proposed list of senior invited course staff/meeting speakers and brief description of contribution to the meeting:

Local teaching staff:

### Subject areas

**Specific event topics and expected impact for the country/region:** Specific event topics and expected impact for the country/region: The topics to be covered in training Workshop/Course includes: Introduction to Functional Metagenomics; Metagenomic sequencing technologies; Recent advances and future trends in Functional Metagenomics; Functional Metagenomics Workflow; Quality Control (Theoretical & Hands-on); Trimming and filtering (Theoretical & Hands-on); Taxonomic and Functional Profiling (Theoretical & Hands-on); Gene Prediction & Functional Annotation(Theoretical & Hands-on); Pathway analysis(Theoretical & Hands-on); Comparison of sample groups (Theoretical & hands-on); functional validation; Concept of global and integrated AMR Surveillance & the potential of functional metagenomics for AMR surveillance; Challenges for the use of functional metagenomics in surveillance; (Genome assembly from metagenomes (Theoretical & Hands-on) and Metagenomic binning and mapping (Theoretical & hands-on) inclusion will be decided later in view of profiles of participants (based on their level of understanding/experience of metagenomes). Application of Machine learning to Metagenomics.

This training workshop will foster multidisciplinary discussions and collaborations among international researchers, principal investigators (PIs), postdoctoral fellows, students (both modelers and biologists), and bioinformatics professionals from R&D institutions, industry, and academia. By engaging 40-50 international and local researchers from COMSATS member countries in theoretical and hands-on laboratory training, the course will enhance their scientific and technical competencies in functional metagenomics techniques.

Participants will develop expertise in metagenomic sequencing technologies, taxonomic and functional profiling, gene prediction, pathway analysis, and functional validation, enabling them to identify and characterize novel biological pathways. The training will also equip them with the skills to analyze metagenomic data using machine learning approaches, advancing computational capabilities for microbiome research.

A key outcome of this training will be the ability to apply functional metagenomics for antimicrobial resistance (AMR) surveillance, genomic surveillance of viruses, and broader multi-omics-driven outbreak response models. These competencies will contribute to better management intervention strategies, data-driven policy decisions, and strengthened regulatory frameworks for infectious disease monitoring and control.



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By providing researchers with hands-on experience in data processing, genome assembly, binning, and mapping, the workshop will empower them to conduct metagenomic research independently and train future scientists within their institutions. Ultimately, this initiative will support the rapid translation of microbiome research into real-world applications, ensuring long-term benefits for global health, environmental monitoring, and biotechnology innovation.

## Summary of event programme, including time allocated for poster presentation and discussion:

### Summary of Event Programme

#### Monday, March 16th – Day 1

##### Foundations of Functional Metagenomics

- 09:00 - 09:30 | Inaugural Session
  - 09:30 - 10:00 | Introduction to the Course and Self-Presentation of Participants
  - 10:00 - 11:00 | Introduction to Functional Metagenomics & Metagenomic Sequencing Technologies
  - 11:00 - 11:30 | Coffee Break
  - 11:30 - 12:30 | Recent Advances and Future Trends in Functional Metagenomics
  - 12:30 - 13:00 | Functional Metagenomics Workflow
  - 13:00 - 14:00 | Lunch Break
  - 14:00 - 14:30 | Functional Metagenomics Workflow
  - 14:30 - 16:00 | Quality Control (Hands-on: Data Preprocessing & QC Tools)
  - 16:00 - 16:30 | Tea Break
  - 16:30 - 18:00 | Trimming and Filtering (Hands-on: Removing Contaminants and Low-Quality Reads)
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#### Tuesday, March 17th – Day 2

##### Taxonomic & Functional Profiling in Metagenomics

- 09:00 - 09:30 | Morning Wrap-up
  - 09:30 - 10:00 | Taxonomic and Functional Profiling: Concepts & Approaches
  - 10:00 - 11:00 | Taxonomic Classification (Hands-on: Classification Pipelines & Databases)
  - 11:00 - 11:30 | Coffee Break and informal discussion
  - 11:30 - 13:00 | Functional Profiling (Hands-on: Identifying Functional Genes & Pathways)
  - 13:00 - 14:00 | Lunch Break
  - 14:00 - 16:00 | Comparison of Sample Groups (Hands-on: Differential Abundance Analysis)
  - 16:00 - 16:30 | Tea Break
  - 16:30 - 18:00 | Comparison of Sample Groups (Hands-on: Statistical Methods & Visualization)
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#### Wednesday, March 18th – Day 3

##### Genome Reconstruction & Surveillance Applications

- 09:30 - 10:00 | Morning Wrap-up
  - 10:00 - 11:00 | Functional Validation & Pathway Analysis (Theoretical & Practical Applications)
  - 11:00 - 11:30 | Coffee Break
  - 11:30 - 13:00 | Functional Validation & Pathway Analysis (Theoretical & Practical Applications)
  - 13:00 - 14:00 | Lunch Break
  - 14:00 - 15:00 | Challenges for the Use of Functional Metagenomics in Surveillance
  - 15:00 - 16:00 | Concept of Global and Integrated AMR Surveillance & the Potential of Functional Metagenomics for AMR
  - 16:00 - 16:30 | Tea Break
  - 16:30 - 18:00 | Genome Assembly from Metagenomes (Hands-on: Assembly Techniques & Tools)
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#### Thursday, March 19th – Day 4

##### Advanced Data Analysis & Computational Approaches

- 09:30 - 10:00 | Morning Wrap-up
- 10:00 - 11:00 | Genome Assembly from Metagenomes (Hands-on: Post-Assembly Processing & Validation)
- 11:00 - 11:30 | Coffee Break
- 11:30 - 12:30 | Application of Machine Learning to Metagenomics (Theoretical & Practical Considerations)
- 12:30 - 14:00 | Lunch Break



14:00 - 16:00 | Final Wrap-Up Session & Future Directions

16:00 - 17:00 | Concluding session and refreshment

**Reasons for the choice of the specific event topics and for holding at this time:** The alarming rise of antimicrobial resistance (AMR) poses a direct threat to global public health, leading to an estimated 1.27 million deaths annually, with projections indicating 10 million deaths per year by 2050 if urgent action is not taken. The misuse and overuse of antibiotics in healthcare, agriculture, and animal husbandry have accelerated the spread of resistance genes, which can rapidly disseminate across clinical, environmental, and agricultural ecosystems through horizontal gene transfer via mobile genetic elements (MGEs).

Despite advancements in sequencing technologies and computational tools, the routine implementation of metagenomics-based AMR surveillance remains limited, particularly in resource-constrained settings. The lack of standardized methodologies, skilled researchers, and integrated surveillance systems continues to hinder early detection and response, increasing the risk of untreatable infections, prolonged hospital stays, and higher mortality rates.

This high-impact training workshop aims to bridge this gap by equipping researchers with the cutting-edge skills needed to detect, monitor, and predict AMR trends in real-time. Functional metagenomics is a powerful approach that enables the discovery and characterization of resistance mechanisms across diverse environments, enhancing our ability to implement data-driven interventions for controlling AMR outbreaks. Participants will gain hands-on experience in:

- Metagenomic Next-Generation Sequencing (mNGS) for real-time pathogen and resistance detection
- Advanced Bioinformatics Pipelines to analyze complex microbiomes
- Machine Learning-Based Resistance Prediction to anticipate emerging threats
- Resistome Profiling & Surveillance Strategies to track the evolution of AMR globally
- Harmonization of Data & Standardization of Methodologies for cross-border collaboration

By fostering global partnerships, data integration, and capacity building, this workshop will empower researchers—especially from low- and middle-income countries (LMICs)—to establish robust AMR surveillance systems. The ability to rapidly detect and contain resistant pathogens will be critical in preventing outbreaks, saving lives, and informing policy decisions that shape the future of infectious disease control.

**International participation:** COMSATS has International Network of S&T Centres of Excellence which has 25 highly reputed centres of science and technologies in the South as nodes and are playing leading roles in their respective areas of specialization. The primary objectives of the workshop are to equip early-career researchers with advanced statistical, algorithmic, and bioinformatics tools for integrating qualitative and quantitative models in functional metagenomics for AMR surveillance, pathogen detection, and predictive analysis. The training will enhance participants' ability to design robust experimental frameworks and implement data integration workflows that combine metagenomics with multi-omics approaches for the early detection and characterization of emerging antimicrobial-resistant pathogens. Additionally, the workshop will strengthen analytical skills for descriptive and predictive modeling, enabling researchers to contribute effectively to AMR surveillance, risk assessment, and public health preparedness.

Later on, a project will be initiated on AMR Surveillance using Functional Metagenomics-based Approach from the platform of COMSATS Centres of Excellence for which Centres have already shown interest including COMSATS University Islamabad (CUI), Islamabad, Pakistan; International Centre for Chemical and Biological Sciences (ICCBS), Karachi, Pakistan; Tianjin Institute of Industrial Biotechnology (TIB), Chinese Academy of Sciences (CAS), China; Al-Farabi Kazakh National University, Kazakhstan; University of The Gambia, The Gambia; Cheikh Anta Diop University, Senegal; Marmara Research Centre, the Scientific and Technological Research Council of Türkiye (TUBITAK), Türkiye, and Sepuluh Nopember Institute of Technology (ITS), Indonesia.



Indicate if the programme will include laboratory practical session(s) which foresee the use of animals: **No**

## **Selection of participants**

**Criteria for selection of ICGEB supported fellows:** The participants must be from Common member country of ICGEB and COMSATS and must have

- o Basic knowledge of some omics data of interest
- o Basic knowledge or practice of the software such as R
- o Basic knowledge of algorithm and statistics (random variable, variance, covariance, correlation)
- o Relevant background in studying biological system

**Criteria for selection of non-supported participants:** The participants must be from Common member country of ICGEB and COMSATS and must have

- o Basic knowledge of some omics data of interest
- o Basic knowledge or practice of the software such as R
- o Basic knowledge of algorithm and statistics (random variable, variance, covariance, correlation)
- o Relevant background in studying biological system

**Registration fee:** No registration fee will be charged from the participants from its member countries as in its 30 years of overarching initiatives based on creative approaches, COMSATS has been mandated to promote capacity building, sharing of knowledge, experiences and good practices, technological research outcomes and education, know-how and scientific resources in its member countries.

**Expected number of young scientists from ICGEB Member States to be supported for participation in the event:** 7-10

## **Venue**

**Laboratory and/or auditorium facilities:** COMSTECH Secretariat, 33 Constitution Avenue, G-5/2, Islamabad, Pakistan

**Lodging facilities:** Tentative - COMSTECH Secretariat, 33 Constitution Avenue, G-5/2, Islamabad, Pakistan

**Transportation arrangements:** COMSATS Secretariat, Shahrah-e-Jamhuriat, G-5/2, Islamabad, Pakistan

**Do you plan to record session:** Yes - video tutorials will be made available to all Co-organisers





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## Budget Summary

Item	Details	Amount (EUR)
Estimated Budget	Total estimated cost	25,000
Grant Requested from ICGEB	Requested funding	15,000
Grant Requested from Co-Sponsors	Expected co-funding	5,000
Other Contributions (Organizing Institutions)	Additional institutional support	5,000

## Breakdown of ICGEB Grant Usage

Type	Air Travel (EUR)	Accommodation (EUR)	DA (EUR)	No. of Days	Aggregate (EUR)	Total (EUR)
Int'l Trainer from ICGEB	1200	70	50	5	600	1800
Int'l Participant	500 x 10 (partial support)	70 x 10	50 x 10	5	6000	11,000
Cost	-	-	-	-	-	2200
Total ICGEB Grant Usage	-	-	-	-	-	15,000

## Co-Sponsorship & Institutional Support

Co-Sponsor	Support Type	Amount (EUR)
<b>COMSTECH</b>	<b>Workshop Venue &amp; Lab Facility</b>	<b>Included</b>
	Round-trip Airfare for 2 Local Participants & Daily Allowance (Accommodation + DSA) (EUR 70 + EUR 50) per day	<b>1800</b>
	Developing Training Manual/Video Content	<b>1000</b>
	Publication, Dissemination & Others (Programme Book, Brochure, Banners, Standees)	<b>1200</b>
	Workshop dinner and Lunch	<b>1000</b>
<b>Total Co-Sponsor Grant Requested</b>	-	<b>5000</b>

## Additional Contributions (COMSATS Headquarters)

Item	Cost per Unit (EUR)	Quantity	Total (EUR)
Round-trip Airfare for 3 International Participants	1100	3	<b>3,300</b>
Daily Allowance (Accommodation + DSA) (EUR 70 + EUR 50) per day	120	3 participants x 5 days	<b>1,800</b>
<b>Total Contribution from COMSATS Headquarters</b>	-	-	<b>5,100</b>



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**The proposal includes names of potential collaborators and a host institution, which have not been finalized and are provided as examples. Interested Centres of Excellence willing to host the workshop are encouraged to express their interest.**