# Dow University of Health Sciences

# Prospectus

## BS Biotechnology

**Session 2022-23**

## Dow College of Biotechnology (DCoB)

email: admissions@duhs.edu.pk
website: www.duhs.edu.pk

# MESSAGE BY VICE CHANCELLOR

**Prof. Mohammed Saeed Quraishy**
Vice Chancellor
Dow University of Health Sciences

It gives me joy to write this message for the prospectus of the Dow University of Health Sciences, Karachi. DUHS was established in 2004, with just three constituent colleges, and today we are a university with over 30 constituent and affiliated institutions and the most comprehensive health system in Pakistan.

This year, I am also proud to announce that Dow University of Health Sciences, Karachi has continued to enhance the vision of this University by striving to be the pre-eminent academic institution committed to changing and saving lives, as we have continued to place in the QS World University Rankings 2021, with an overall Rank of 401-450. This is a credit to the faculty of DUHS, and their commitment to enhance the learning experience offered to our students that we have achieved progress and prosperity globally, particularly within Asia.

This is also the year we are celebrating our 75th Anniversary of the founding of Dow Medical College, a symbol of scholarship and service to the community that has evolved into DUHS, with expanded program offerings, such as in the fields of the allied health and biomedical sciences, such as pharmacy, physical therapy, medical technology, biotechnology, nursing, public health, business administration, and course in radiology technology, nutritional sciences, midwifery, and optometry.

Furthermore, our symbol of academic excellence is fortified by our adoption of the latest technology, and affordable state of the art healthcare offered, which informs the delivery of quality patient care at Dow University Hospital and our many affiliated healthcare centers and research and diagnostic laboratories. We stand committed to providing and creating a state-of-the-art infrastructure that fosters innovation, research and is evolving to meet the needs of the future, along with providing superior healthcare services today.

Today, we are striving to play a pivotal role in the early diagnosis and treatment of Covid-19 and in the future, I also stand committed to make Dow University of Health Sciences an empowered institution offering the best of the medical knowledge and quality health services.

I am confident that the doctors and health professionals of this institution will go on to contribute to this nation and serve globally with sincerity and ethics, in order to restore faith and humanity to the delivery of healthcare.

Good Luck to the incoming freshmen!

# MESSAGE BY PRINCIPAL

**Prof. Dr. Mushtaq Hussain**
Principal
**Ph.D.** (Genetics, Genomics and Systems Medicines)
University of Glasgow, UK

It gives me immense pleasure to welcome the new batch of Dow College of Biotechnology. The world of science is fast moving and progressing at a teeming pace. Resultantly, many new branches of science have been developed to entertain the need of time and to address emerging problems of modem-day world. Biotechnology is by all means one such branch of science, amalgamating classical and modern disciplines of both natural and physical sciences with particular focus on seeking and developing practical applications of theoretical knowledge. Dow College of Biotechnology, an institute of prestigious Dow University of Health Sciences, holds the same core theme in its foundation and the college is well regarded for imparting both academic and practical skills amongst the students.

Dow College of Biotechnology has progressed exceptionally well and is now known for its academics and research throughout the country. In recent times, research conducted at Dow College of Biotechnology during the COVID-19 pandemic has been praised both nationally and internationally and leads to some of the best research publications from Pakistan on SARS-CoV-2 with considerable theoretical and practical insights.

The college holds a large sum of Ph.D. faculty which are actively engaged in research alongside the teaching activities. To ensure translation of theoretical knowledge into practical application, students are encouraged to get engaged with small to advance level research projects with faculty as they move along during four years of their studies. This approach makes Dow College of Biotechnology unique amongst its contemporaries. One testimony is that the graduates of DCOB along with the faculty have extensively published in the peer reviewed international scientific journals in the last two years.

Dow College of Biotechnology maintains strong linkage with the industries to keep students aware of their recent development and demands. The college has recently developed linkage and student exchange programs with some of the prestigious international universities. With a team of highly competent faculty and supporting staff, I am confident that we will extend our utmost support to the students to excel in their respective carriers.

I wish all the best to the prospective students at Dow College of Biotechnology, God Speed.

# VISION STATEMENT DUHS

**Be an academic leader by generating creative, collaborative, contextual resources to improve health and education by all possible means.**

# MISSION STATEMENT DUHS

**To provide leadership in creating and imparting knowledge through excellence in research and education with the aim to provide cost effective, contextually relevant and quality community services through its faculty, staff and graduates, with continuous efforts for improvement through reflection and learning.**

# INTRODUCTION OF DOW COLLEGE OF BIOTECHNOLOGY

## DOW COLLEGE OF BIOTECHNOLOGY

Dow College of Biotechnology (DCoB) is a constituent College of Dow University of Health Sciences. The college is in the graceful building of Dow Research and Diagnostics Complex. Currently, a four-year BS Biotechnology program is conducted at DCoB. The College has excellent teaching faculty comprised of foreign qualified PhD scientists who are extensively involved in research activities and hence are well aware of the recent developments in the field of science. Teaching methodology at DCoB is a well-planned blend of theory and practical skills. To facilitate this, state of art research and academic laboratories are the integral component of the college premises. Additionally, the centrally air-conditioned college has large size lecture halls, seminar room, and students' discussion rooms. For students who have a passion for becoming scientists and professionals of their respective fields, Dow College of Biotechnology provides an excellent platform. The BS-Biotechnology curriculum has been meticulously designed to produce competent human resource in the field of biotechnology, and to train the graduates to apply the gained scientific knowledge to address locally prevalent health, environmental, food and industrial issues.

## Scope of Biotechnology in Pakistan

Biotechnology is one of the most growing and exciting fields of science in the world. Biotechnology is the application of any biological system (living organisms or their derivatives) to address any problem related to human life. It is a multidisciplinary science which utilizes knowledge generated in the field of genetic engineering, genetics, tissue culture, stem cell, molecular biology, microbiology, biochemistry, vaccinology, virology, and bioinformatics to address existing issues. Biotechnology students are trained for innovation, creative thinking, entrepreneurship, and multidisciplinary approach to develop products for the benefit of human life. There are different branches of biotechnology which includes food biotechnology, health and medical biotechnology, microbial biotechnology, agricultural biotechnology, environmental biotechnology, pharmaceutical biotechnology, industrial biotechnology, marine biotechnology, animal biotechnology etc.

Due to strong academic and practical training provided to biotechnology graduates, they are among the top choice of academic, research and industrial employer. Demand of biotechnology products is rising in Pakistan and therefore there is a huge scope for biotechnology students in terms of jobs and entrepreneurship. Following is some of the applications of biotechnology:

- To produce r-DNA products, monoclonal antibiotics, vaccines, diagnostics, anticancer drugs, insulin, skin grafting and development of tissue specific delivery methods.
- To produce safe, efficient, and cost-effective industrial chemicals and enzymes for textile, paper, sugar and food industries, biodegradable plastics etc.
- To produce a wide range of GM crops, bio fertilizers, bio pesticides.
- To improve environmental conditions through soil and water remediation, oil spillage, water and sewerage treatment.
- To produce fermentation-based products, cheese, yeast, wine, beer, yogurt, food additives etc.

## Eligibility Criteria of the Candidate

- HSSC Intermediate Science (Pre-Medical or Pre-Engineering) / A-Level or Equivalent, Min. 60% marks or equivalent only certified by IBCC
- Candidate's Domicile of Sindh

**Seat Distribution for BS-Biotechnology Course at Dow College of Biotechnology**

Dow College of Biotechnology offers a total of 100 seats, which are filled totally on merit basis.

## 1) Fee Structure of BS BIOTECHNOLOGY
## Session 2022-23

| FEE TYPE | BS Biotechnology |
|---|---|
| Admission Fee | 45,000/- |
| Tuition Fee | 142,612/- |
| Document Verification Charges | 1,000/- |
| **Total** | **188,612/-** |

*Above amounts are excluding govt. taxes. Taxes apply as per FBR rules

Transport Fee (Optional) Rs. 32,000/- per year.

# RULES FOR THE PAYMENT OF FEE

Payorder of one year tuition fee (of the respective category) will have to be paid within one month after the start of 2nd, 3rd, 4th & Final year.

In case the fee is not submitted during the given specified time, late payment charges will be charged as follows:

First month after lapse of first month…….2.5 % of tuition fee
Second month …….5.0 % of tuition fee
Third month…….7.5 % of tuition fee
Fourth month……10 % of tuition fee

Fee of all categories may be increased by 10% every year.

AFTER FOUR MONTHS OF NON PAYMENT, THE SEAT IS LIABLE TO BE CANCELLED AND STUDENT WILL NOT BE ALLOWED TO APPEAR IN ANY EXAMINATION

Fee deposited is refundable as per the Refund policy guidelines of the DUHS.
Taxes will be applied as per the FBR rules.

Hostel and Transport fee will be valid till the last exam of the academic year.
Amounts stated in the fee vouchers are excluded of all Bank charges.
The Fee Structure may be revised by the university at any time during the course of the study, due to unavoidable circumstances.

## Recognition by Governing Bodies/Councils

The BS-Biotechnology program is approved by syndicate of Dow University of Health Sciences and the curriculum is approved by Higher Education Commission, Pakistan. The curriculum has been designed following centralized BS-Biotechnology curriculum of HEC with availability of series of quality-based laboratories are one of the chief factors in deciding the success of the program. The laboratories available at the DUHS are state-of-the-art and sufficiently equipped to facilitate the learning objectives of this curriculum.

## Curriculum

BS Biotechnology at DUHS is a Four-year degree program comprising of eight semesters in total. The course lay out is prescribed by the Higher Education Commission (HEC) of Pakistan, which consists of 47 courses of 134 credit hours. In this program, great emphasis is placed upon integrating theory with practice as the curriculum is divided into both theoretical and laboratory-based learning. It is to enable students to attain the required level of expertise, before further practically testing out classroom knowledge through experiments.

# STRUCTURE

| Categories | No. of courses | Credit hours |
|---|---|---|
| Compulsory and General Courses | 18 | 53 |
| Biotechnology Specific Foundation Courses | 12 | 36 |
| Major Courses<br>(Including research project / internship) | 13 | 35 |
| Elective Courses | 4 | 12 |
| Total | 47 | 136 |

- **Total number of credit hours:** 136
- **Duration:** 4 years
- **Number of semesters:** 8
- **Semester duration:** 16-18 weeks
- **Number of courses per semester:** 5-6

# BS-BIOTECHNOLOGY (4 YEAR) CURRICULUM DESIGN

| Compulsory and General Courses<br>18 Courses<br>53 Credit Hours | | | |
|---|---|---|---|
| Subject | Cr. hr | Subject | Cr. hr |
| 1. English I, | 3+0 | 10. Physical & Inorganic Chemistry | 2+1 |
| 2. English II | 3+0 | 11. Organic Chemistry | 2+1 |
| 3. English Ill | 3+0 | 12. Ecology, Biodiversity and evolution | 3+0 |
| 4. Pakistan Studies | 3+0 | 13. History and Creative Arts | 3+0 |
| 5. Islamic Studies/Ethics | 3+0 | 14. Probability, Biostatistics & Logical Analysis | 3+0 |
| 6. Biosafety & Bioethics | 2+0 | 15. Biological Physics | 3+0 |
| 7. Mathematics-I (Pre-calculus)/ lntro to Biology | 3+0 | 16. Philosophy | 3+0 |
| 8. Biomathematics | 3+0 | 17. Economics | 3+0 |
| 9. Introduction to computer science | 2+1 | 18. Marketing | 3+0 |

| Discipline Specific Foundation Courses | | Major Courses (Including research project/Internship) | | Elective Courses within the major | |
|---|---|---|---|---|---|
| 13 Courses | | 12 Courses | | 4 courses | |
| 39 Credit Hours | | 32 Credit Hours | | 12 Credit Hours | |
| Subject | Cr. hr | Subject | Cr. hr | Subject | Cr. hr |
| 1. Microbiology | 2+1 | 1. Principle of Biochemical Engineering | 2+1 | 1. Pharmaceutical Biotechnology | 3+0 |
| 2. Biochemistry-I | 2+1 | 2. Agriculture Biotechnology | 2+1 | 2. Cell and Tissue Culture | 3+0 |
| 3. Biochemistry-II | 2+1 | 3. Health Biotechnology | 3+0 | 3. Animal Biotechnology | 3+0 |
| 4. Cell Biology | 2+1 | 4. Environmental Biotechnology | 3+0 | 4. Virology | 3+0 |
| 5. Classical Genetics | 3+0 | 5. Food Biotechnology | 3+0 | | |
| 6. Analytical Chemistry & instrumentation | 2+1 | 6. Genomics & Proteomics | 3+0 | | |
| 7. Molecular Biology-II | 2+1 | 7. Bioinformatics | 2+1 | | |
| 8. Introduction to Biotechnology | 2+1 | 8. Industrial Biotechnology | 3+0 | | |
| 9. Immunology | 3+0 | 9. Research Methodology & skills enhancement | 3+0 | | |
| 10. Methods in Molecular Biology | 2+1 | 10. Seminar-l | l+0 | | |
| 11. Genetic resources and conservation | 3+0 | ll. Seminar-II | 1+0 | | |
| 12. Microbial Biotechnology | 2+1 | 12. Research Thesis /Project/Special Paper-I & II | 3+0 | | |
| 13. Molecular Diagnostics | 3+0 | | | | |

## ASSESSMENT METHODS

The examinations for BS Biotechnology are conducted semester wise through centralized examination department. Assessments are both theoretical and practical based on the requirements of a specific course. An internal evaluation by the respective faculty members based on pre-defined scoring criteria is also included in the assessment. A student needs to pass the previous semester's courses, including any pre-requisites, before moving onto the next semester. All 47 courses, including electives and credit hour-based research work, must be passed in order to claim the degree.

## NUMBER OF STUDENTS GRADUATED AND STUDYING

| Year of enrollment | No. of students enrolled |
|---|---|
| 2015-2016 | 78 |
| 2016-2017 | 104 |
| 2017-2018 | 100 |
| 2018-2019 | 100 |
| 2019-2020 | 100 |
| 2021- 2022 | 100 |

# FACILITIES

The College is centrally air conditioned with multiple academic and research laboratories, lecture hall, seminar room and library.

## Bioinformatics Laboratory

## Lecture Halls

## College Library

## Bioprocessing Unit

Dow College of Biotechnology is also furnished with a large-scale Bioprocessing Unit with a capacity of 500 L. This will allow students to witness the production of biotechnological nature at an industrial scale.

## Dow Fly Research Lab and Sock Center

Dow College of Biotechnology has a dedicated Drosophila research facility “Dow Fly Research Lab and Sock Center”. The facility is first of its kind in Pakistan. The facility provides services for Bioactive Molecule Screening, Oncogenicity and Teratogenicity testing, Hepatotoxicity &Nephrolithiasis testing in animal model.

# EXTRACURRICULAR ACTIVITIES

## ORIENTATION DAY of DCoB-2021

# SPORTS TEAM OF DCoB


# MEDIA EXPOSURE OF DCoB STUDENTS

# PARTICIPATION OF DCoB STUDENTS IN NATIONAL AND INTERNATIONAL SCIENTIFIC EVENTS

# RECENT PRIZES AWARDED TO DCoB STUDENTS



# DCoB FACULTY PARTICIPATION IN NATIONAL AND INTERNATIONAL SCIENTIFIC EVENTS

# ACHIEVEMENTS

## SELECTED INTERNATIONAL PUBLICATIONS OF DCoB STUDENTS AND FACULTY


1. Ali S, Shalim E, Farhan F, Anjum F, Ali A, Uddin SM, Shahab F, Haider M, Ahmed I, Ali MR, Khan S. Phase II/III trial of hyperimmune anti-COVID-19 intravenous immunoglobulin (C-IVIG) therapy in severe COVID-19 patients: study protocol for a randomized controlled trial. Trials. 2022 Dec; 23(1):1-0.

2. Gul A, Khan S, Arain H, Khan H, Ishrat U, Siddiqui M. Three-phase partitioning as an efficient one-step method for the extraction and purification of bromelain from pineapple crown waste. Journal of Food Processing and Preservation. 2022 Aug 12.

3. Hussain, M., Amanullah, A., Aslam, A., Raza, F., Arzoo, S., Qureshi, I.W., Waheed, H., Jabeen, N., Shabbir, S., Sayeed, M.A., Quraishy, S. Design and Immunoinformatic Assessment of Candidate Multivariant mRNA Vaccine Construct against Immune Escape Variants of SARS-CoV-2. Polymers, 2022, 14, 3263

4. Zainulabid, U.A., Mat Yassim, A.S., Hussain, M., Aslam, A., Soffian, S.N., Mohd Ibrahim, M.S., Kamarudin, N., Kamarulzaman, M.N., Hin, H.S., Ahmad, H.F. (2022). Whole genome sequence analysis showing unique SARS-CoV-2 lineages of B. 1.524 and AU. 2 in Malaysia. *PloS One*, 17(2): e0263678.

5. Sahar, N., Arif, S., Iqbal, S., Riaz, S., Fatima, T., Ara, J., Banks, J. (2022). Effects of drying surfaces and physical attributes on the development of Aflatoxins (AFs) in red chilies. *Journal of Food Processing and Preservation*, 46(2): e16173.

6. Shabbir, A., Waheed, H., Ahmed, S., Shaikh, S. S., Farooqui, W. A. (2022). Association of salivary Cathepsin B in different histological grades among patients presenting with oral squamous cell carcinoma. *BMC Oral Health*, 22(1): 1-9.

7. Aman, A., Shahid, F., Pervez, S. (2022). Exploration of a three-dimensional matrix as micro-reactor in the form of reactive polyaminosaccharide hydrogel beads using multipoint covalent interaction approach. *Biotechnology Letters*, 44(2): 299-319.

8. Shahbaz, U., Basharat, S., Javed, U., Bibi, A., Yu, X. B. (2022). Chitosan: A multipurpose polymer in food industry. *Polymer Bulletin*, 1-23.

9. Gul, A., Siddiqui, M., Arain, H., Khan, S., Khan, H., Ishrat, U. (2021). Extraction, partial purification and characterization of Bromelain from pineapple (*Ananas comosus*) crown, core and peel waste. *Brazilian Arch. Biol. Technol.,* 64: e21200639.

10. Majeed, M.M., Ahmed, I., Roome, T., Fatima, T., Amin, R. (2021). Association between Interleukin-1β gene polymorphism and chronic periodontitis. *European Journal of Dentistry*, 15(4): 702-706.

11. Batool, T.S., Hussain, M., Masnoon, J., Abdullah, A., Ali, S., Shahzad, S., Raza, S. (2021). Investigating sequence variation in the PNPi protein gene of *Puccinia striiformis* f. sp. *tritici* and its interaction with wheat NPR1 protein. *J Plant Pathol*., 103: 1231–1241.

12. Khan, Z.M., Waheed, H., Khurshid, Z., Zafar M.S., Moin, S.F., Alam, M.K. (2021). Differentially expressed salivary proteins in dental caries patients. BioMed Research International, 2021, https://doi.org/10.1155/2021/5517521.

13. Raza F, Hussain M. (2021). Birth and death of CYLD paralogues in vertebrates. *Gene Reports*, 24: 101190.

14. Khan ZM, Waheed H, Khurshid Z, Zafar MS, Moin SF, Alam MK. Differentially expressed salivary proteins in dental caries patients. BioMed Research International. 2021.

15. Majeed MM, Ahmed I, Roome T, Fatima T, Amin R. Association between Interleukin-1β Gene Polymorphism and Chronic Periodontitis. European Journal of Dentistry. 2021.15(04):702-6.

16. Zehravi M, Wahid M, Ashraf J, Fatima T. Whole-Exome Sequencing Identifies Small Mutations in Pakistani Muscular Dystrophy Patients. *Genetic Testing and Molecular Biomarkers*. 2021. 25(3):218-26.

17. Amin R, Khan S, Zeb TF, Ali S, Baqai N, Baqai M, Shuja S. Knowledge and attitudes toward genetically modified (GM) food among health sciences university students in Karachi, Pakistan. Nutrition & Food Science. 2021.

18. Gul A, Siddiqui M, Arain H, Khan S, Khan H, Ishrat U. Extraction, Partial Purification and Characterization of Bromelain from Pineapple (Ananas Comosus) Crown, Core and Peel Waste. Brazilian Arch. Biol. Technol. 2021. 5;64.

19. Ali S, Uddin SM, Shalim E, Sayeed MA, Anjum F, Saleem F, Muhaymin SM, Ali A, Ali MR, Ahmed I, Mushtaq T. Hyperimmune anti-COVID-19 IVIG (C-IVIG) treatment in severe and critical COVID-19 patients: A phase I/II randomized control trial. EClinicalMedicine. 2021. 36:100926.

20. Ali S, Uddin SM, Ali A, Anjum F, Ali R, Shalim E, Khan M, Ahmed I, M Muhaymin S, Bukhari U, Luxmi S. Production of hyperimmune anti-SARS-CoV-2 intravenous immunoglobulin from pooled COVID-19 convalescent plasma. Immunotherapy. 2021. 13(5):397-407.

21. Hussain M, Shabbir S, Amanullah A, Raza F, Imdad MJ, Zahid S. Immunoinformatic analysis of structural and epitope variations in the spike and Orf8 proteins of SARS-CoV-2/B. 1.1. 7. J. Med. Virol. 2021. 93(7):4461-8.

22. Batool TS, Hussain M, Masnoon J, Abdullah A, Ali S, Shahzad S, Raza S. Investigating sequence variation in the PNPi protein gene of Puccinia striiformis f. sp. tritici and its interaction with wheat NPR1 protein. J. Plant Pathol.. 2021. 103(4):1231-41.

23. Raza F, Hussain M. Birth and death of CYLD paralogues in vertebrates. Gene Reports. 2021. 1;24:101190.

24. Uddin N, Hussain M, Rauf I, Zaidi SF. Identification of key pathways and genes responsible for aggressive behavior. Comp. Biol. Chem. 2020. 88:107349.

25. Hussain M, Jabeen N, Shabbir S, Udin N, Aziz B, Amanullah A, Raza F, Baig AA. Dataset for homologous proteins in Drosophila melanogaster for SARS-CoV-2/human interactome. Data Brief. 2020.32:106082.

26. Hussain M, Jabeen N, Amanullah A, Baig AA, Aziz B, Shabbir S, Raza F, Uddin N. Molecular docking between human TMPRSS2 and SARS-CoV-2 spike protein: conformation and intermolecular interactions. AIMS Microbiol. 2020;6(3):350.

27. Shahid F, Ansari A, Aman A, Qader SA. A Comparative Study Among Different Protocols of Immobilization of Dextranase Using Chitin as a Matrix. Catalysis Letters. 2020. 150(3):613-22.

28. Nawaz R, Gul S, Amin R, Huma T, Al Mughairbi F. Overview of schizophrenia research and treatment in Pakistan. Heliyon. 2020. 6(11): e05545.

29. Grazielle-Silva V, Zeb TF, Burchmore R, Machado CR, McCulloch R, Teixeira SM. Trypanosoma brucei and Trypanosoma cruzi DNA mismatch repair proteins act differently in the response to DNA damage caused by oxidative stress. Frontiers in cellular and infection microbiology. 2020.10:154.

## RESARCH GRANTS AWARDED TO DCoB FACULTY

1. “In-Vitro and in-Vivo Studies of Camel Milk Proteins and Peptides - A Potential Therapeutic Approach towards Liver Cirrhosis”, Awarded by International Foundation for Science (IFS), Swedon.

2. “Small Variations for Big Changes”, Awarded by European Society for Evolutionary Biology (ESEB), UK.

3. “Screening COVID-19 Vaccinated and UnVaccinated Population for Hematological Markers, Awarded by Loyola University, Chicago-USA.

4. “Development of Thrombosis Model for Screening of Antithrombotic Drugs”, Awarded by Loyola University, Chicago-USA

5. “Demonstration and Promotion of a Series of Tuberculosis Treatment and Prevention Products”, Awarded by Institute of Biophysics-Chinese Academy of Sciences (IBP-CAS), China.

6. “Development of Pilot Scale System for Phycoremediation of Textile Effluent with Concomitant Production of Algal Biomass”, Awarded by Higher Education Commission, Pakistan.

7. “Development of Raloxifene-Loaded Self-Nanoemulsifying Drug Delivery System (SNEDDS) with Enhanced Bioavailability Potential: A Therapeutic Implication in Osteoporosis”, Awarded by Higher Education Commission, Pakistan.

8. “Evaluation of Anti-Rheumatic Potential of Ticagrelor in Rheumatoid Arthritis Fibroblast-like Synoviocytes via Modulation of NLRP3 Inflammasome”, Awarded by Higher Education Commission Sindh, Pakistan.

9. “Error Rate and Coefficients Quantification of Neurological Defects due to Consanguineous Mating using *Drosophila melanogaster* Model”, Awarded by Vice Chancellors' Seed Funding Initiative (VCSFI), Karachi, Pakistan

10. “Development of *Drosophila melanogaster*-Based Assay System for Screening of Carcinogenic Compounds”, Awarded by Vice Chancellors' Seed Funding Initiative (VCSFI), Karachi, Pakistan.

11. “Isolation, Purification and Characterization of Bioactive and Anti-cancerous Small Molecules from *Oxalis corniculate*”. Awarded by Vice Chancellors' Seed Funding Initiative (VCSFI), Karachi, Pakistan.

12. “Osteoinductive Potential of Selenium Nanoparticles via Regulation of Oxidative Stress in Human Umbilical Cord Derived-Mesenchymal Stem Cells: A Promising Therapeutic Approach in Bone Disorders”. Awarded by Vice Chancellors' Seed Funding Initiative (VCSFI), Karachi, Pakistan.

13. “*In-vitro* Propagation and Enhanced Cannabinoids Production of *Cannabis Sativa* L. (Industrial Hemp)”. Awarded by Vice Chancellor’s Seed Funding Initiative (VCSFI), Karachi, Pakistan.

14. “Investigating Protein Interaction of Cancer Associated Ubiquitin Specific Proteases”, Awarded by Higher Education Commission, Pakistan.

15. “Establishment of high cell density culture of *Sacchromyces boulardii* and scale up using bench scale bioreactor”: Demonstration of lab scale probiotic production”, Awarded by Higher Education Commission, Pakistan.

16. “Development of first Commercial scale citric acid production plant in Pakistan by submerged fermentation of *Aspergillus niger* using cane molasses as raw material; A milestone yet to be achieved”, Awarded by Higher Education Commission, Pakistan.

17. “Hemicellulosic furfural production from sugarcane bagasse”, Awarded by Higher Education Commission, Pakistan.

18. “Plantation drive for *Moringa olifera* (Sohanghna) plant across university campus and awareness campaign regarding its nutritional and medicinal value”, Awarded by Higher Education Commission, Pakistan.

19. “Mass production of commercially important micro algae through distillery effluent and selection of specific algal strains”, Awarded by Pak Ethanol (PVT) Limited, Pakistan.

# INTERNATIONAL INSTITUTIONAL LINKAGES

Dow College of Biotechnology has strong collaborative research links with universities around the world. The numbers are growing each year.

- Loyola University, USA
- Chapman University, USA
- Universite de Lausanne Hospital Opthalmique Jules-Gonin Lausanne, Switzerland
- Department of Pathology and Immunology PATIM, University of Geneva, Switzerland
- Universiti Malaysia Pahang (UMP), Malaysia

# FUTURE PROSPECTS

BS Biotechnology opens us a wide range of career opportunities due to the multidisciplinary nature of the program. Globally, Biotechnology is an emerging field of science with an ever-increasing demand for biotechnology graduates. The past two years of COVID-19 pandemic has profoundly demonstrated the importance of Biotechnology. The curriculum of this program would put students in a strong position in the market for careers in Genetic Engineering, Cell & Molecular Biology, Stem cell, Biochemistry, Molecular Genetics, Biotechnology, Microbiology, Diagnostics and Bioinformatics. Research and development opportunities can be availed not only in hospitals and public health laboratories but also in major industries of pharmaceuticals, food and agriculture.

Students graduating from this program will be prepared for jobs that provide research and development breakthrough products and technologies to combat debilitating and rare diseases, reduce our environmental footprint, feed the hungry, use less and cleaner forms of energy, and have safer, cleaner and more efficient industrial manufacturing processes. Jobs which are directly related to the degree pertains to the research and development field including Biomedical scientist, Clinical Research Associate, Food Technologist, Microbiologist, Pharmacologist and Research Scientists. Additionally, BS Biotechnology degree may also be useful for careers in Ecology, Forensic Medicine, Science Writing and Environmental Science.

# FACULTY

**Prof. Dr. Mushtaq Hussain**
Principal
Ph.D. in Genetics, Genomics and Systems Medicines
University of Glasgow, UK

**Dr. Humera Waheed**
Vice Principal
Ph.D. in Biochemistry
ICCBS, University of Karachi

**Dr. Rafat Amin**
Associate Professor
Ph.D. in Natural Sciences
Eberhard Karls Universitat Tuebingen Germany

**Dr. Sadaf Khan**
Associate Professor
Ph.D. in Biochemistry
University of Western Australia, Australia

**Dr. Tehseen Fatima**
Associate Professor
Ph.D. in Infection and Immunity
University of Glasgow, UK

**Dr. Anum Gul**
Assistant Professor
Ph.D. in Molecular Medicine
ICCBS, University of Karachi

**Dr. Sheeba Naz**
Assistant Professor
Ph.D. in Biotechnology
ICCBS, University of Karachi

**Dr. Faiza Nadeem**
Assistant Professor
Ph.D. in Biotechnology
KIBGE, University of Karachi

**Dr. Salman Ahmed**
Assistant Professor
Ph.D. in Molecular Medicine
ICCBS, University of Karachi

**Dr. Nida Dastagir**
Assistant Professor
Ph.D. in Molecular Medicine
ICCBS, University of Karachi

**Dr. Maheera Moin**
Assistant Professor
Ph.D. in Chemistry
Sheffield Hallam University, UK

**Dr. Urooj Javed**
Assistant Professor
Ph.D. in Biotechnology
KIBGE, University of Karachi

**Engr. Tabish Ali**
Senior Lecturer
BE (Chemical Eng), ME (Environmental Eng)
NED University

**Ms. Urooj Ishrat**
Instructor
M.Sc. (Physiology), MPhil (Biotechnology)
Dow University of Health Sciences

**Mr. M. Mujtaba Khan**
Instructor
MPhil (Biotechnology)
Dow University of Health Sciences

**Ms. Iqra Ahmed**
Instructor
M.Sc. (Microbiology), MPhil (Biotechnology)
Dow University of Health Sciences

**Ms. Aliya Shujjat**
Lab Manager
BS (Biotechnology)
University of Karachi

**Ms. Sherish Butt**
Lab Manager
M.Sc. (Genetics)
University of Karachi

**Ms. Ruqiya Fatima**
Lab Manager
BS (Microbiology)
University of Karachi

**Ms. Hanzalah Khan**
Lab Manager
M.Sc. (Microbiology)
University of Karachi