Department of Biotechnology

Proforma for submission of Annual Progress Report supported under Star College Scheme

1. Name of the College: **St. Xavier's College**

2. Name of Coordinator, Designation, Address, Phone nos.: **Dr. Trelita de Sousa, Assistant Professor, Department of Microbiology, St. Xavier's College, Mapusa, Goa, +91-9822315746**

3. Assessment duration: **01/04/2022 to 31/03/2023** Duration in years: **01 year**

4. Details of Departments Supported

S. No	Name of Department	Courses (B.Sc./M.Sc./PG Diploma,certificate etc.) offered	Regular Faculty members	
			Total = 57	
			With Ph.D. = 22	WithoutPh.D. = 35
1	Biotechnology	B.Sc.	Nil	Nil
	Microbiology	B.Sc.	04	07
2	Botany	B.Sc.	07	03
3	Chemistry	B.Sc., M.Sc.	05	10
4	Computer Science	B.Sc.	Nil	06
	Mathematics	B.Sc.	02	03
5	Electronics	B.Sc.	01	02
6	Physics	B.Sc.	03	04

5. Number & Date of Advisory committee meeting:

S. No.	Nature	Date	Participants
1	Internal Advisory Committee Meeting (contact mode)	22nd September 2022	Local Advisory Committee members
2	Internal Advisory Committee Meeting (contact mode)	17th October 2022	External Subject Experts, Local Advisory Committee members

6. Qualitative improvements due to DBT support. Please highlight 5 salient points (within 500 words).

(You may enumerate 5 minor projects where students were involved and their impact or similar activities andtheir outcome; this is for representative purpose and coordinator may include details as per his own choice; kindly refrain from providing philosophical data Avoid any introduction. All the

justifications must be very crisp like any aspect non-existent pre-STAR Scheme and you achieved after the grant).

1. **Faculty Enrichment in Advanced Instrumentation**

   Faculty members were able to participate in specific subject-based and advanced training programmes at Institutes of repute that equipped them with the expertise and skill in advanced instrumentation and technologies. They in turn trained several others through sessions conducted at state and national-level seminars and workshops.

2. **Interdisciplinary, Multidisciplinary, and Transdisciplinary Learning**

   The large number of invited lectures conducted through DBT support exposed the students to subjects / topics other than their discipline. This helped broaden the horizons of the student learning process and opened novel avenues in interdisciplinary and transdisciplinary areas for higher studies, research, and career opportunities.

3. **Smart Teaching Aids and Reading Material**

   The purchase of smart boards through the DBT Star College Scheme introduced a new teaching-learning experience making students interactive and engaged. Ample reading material, reference books, e-books, and journals were made available giving students a wider choice for reference matter and self-study.

4. **Laboratory Manuals and SOPs**

   The formulation of laboratory manuals and SOPs promoted systematic working in the laboratories. Students imbibed good and safe laboratory practices. Student confidence levels in experimental work increased which yielded better results and conscious use of laboratory equipment and consumables.

5. **Student-driven Community Service**

   The large number of outreach activities conducted by the beneficiary departments inculcated a sense of social responsibility among students who now wanted to be involved in reaching out and promoting science education at school and higher secondary levels. These outreach programmes not only helped bring about awareness among the general public but also helped our students become more responsible towards science, the community, and the environment.

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Some of the major student-centred activities undertaken under the DBT Star College Scheme include:

1. **Journal Club**

   The Department of Microbiology initiated a Journal Club for its students. Students were given a choice to shortlist a research paper of their interest, decipher all the information published, and present it to their classmates and other B.Sc. students. The activity helped disseminate new research findings, ideas, and insights to a student audience and helped them become more forthcoming and learn effective presentation and communication skills. Furthermore, it helped students develop scientific orientation and keep abreast with recent research trends.

2. **Sky Gazing Programme**

   The Department of Physics organised a sky gazing programme to help develop an interest among the students, faculty members, and parents in the knowledge of planets, stars, the universe, and space tourism. The participants were able to observe and better understand how to locate and identify the various planets and stars including Venus, pole star, and different constellations using a 6-inch reflector telescope.

3. **Bridge Course "Chemistry and Mathematics essential for biologists"**

   The Department of Microbiology in coordination with the Departments of Chemistry and Mathematics organised a bridge course for its students to reinforce the basic concepts in Chemistry and Mathematics essential for biology students and which would help them conduct laboratory experimentation and calculations.

4. **Multidisciplinary National-level Seminar "Emerging Trends in Science and Technology"**

   The 8 beneficiary departments came together to organise a multidisciplinary national-level seminar that integrated the perspectives of multiple disciplines to explore novel ideas, deliberate scientific information, and garner a deeper understanding of the relevant domains of science and technology. The seminar was a unique compendium of virtually every field of science and provided a platform for research, teaching, and scientific learning. It provided a transdisciplinary approach of integrating scientific knowledge, expertise, and emerging trends in all scientific domains.

5. **State-level Outreach Workshop "Let's Explore"**

   The 8 beneficiary science departments organised a state-level outreach workshop for science higher secondary students. The workshop introduced the students to the exciting opportunities

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in the world of science through laboratory sessions which provided them basic hands-on experience in various basic scientific techniques.

7. Any Novel aspect introduced or planning to introduce during the Scheme duration.

Novel aspects introduced

- Journal Club for third-year students exposed them to novel research trends, ideas, and insights and helped students develop scientific reasoning and effective presentation skills.
- Promotion of science in schools through student-driven outreach programmes on "The Fascinating World of Microbiology" and "Microfermentors" helped sensitize students to be more involved and aware of science and technology in everyday life and collaborative learning.
- The formulation of SOPs and Laboratory Manuals facilitated laboratory learning and instrumentation handling.

Novel aspects planning to introduce

- A comprehensive workshop on laboratory instrumentation, advanced instrumentation, working, servicing, and repair for faculty members, research scholars, and laboratory staff in collaboration with the Western Regional Instrumentation Centre, Mumbai
- Popularizing the understanding of pure science in schools through an innovative All Goa interschool pure science festival

8. Lessons learnt / difficulties faced/suggestions if any, in implementation of the programme and utilization of DBT grant. (Max 3 points within 300 words).

- The significance of participant feedback for activities conducted was valued. The feedback provided scope for further improvement and chalked out a map for future activities
- Several difficulties were faced while making payments. The freezing of the accounts, change of banks, change in payment portals, etc. resulted in difficulties and awkward interactions with the sellers of unprecedented nature. The unavailability of guidance and streamlined protocols for using the Idigipay and PFMS portals continue to cause unnecessary delays.

- The Departments like Microbiology and Biotechnology; Computer Science and Mathematics which were combined into unit departments had insufficient funds to sustain their activities.

9. **Key performance indicators**

S. No	Indicator	Pre-support (2020-2021)								During /After Support (2022-2023)								Remarks
1	No. of students admitted	Total = 224								Total = 211								
		M= 70				F= 154				M= 75				F= 136				
		SC 0	ST 0	OBC 15	G 55	SC 5	ST 1	OBC 47	G 101	SC 0	ST 2	OBC 21	G 52	SC 1	ST 0	OBC 31	G 104	
2	No. of students passing out (%) Students Admitted/passing out (pass %)	Biotechnology: 16 (100%)								30 (93.3%)								
		Microbiology: 75 (100%)								57 (100%)								
		Botany: 20 (100%)								15 (100%)								
		Chemistry: 80 (100%)								64 (90.6%)								
		Computer Science 26 (100%)								14 (87.5%)								
		Mathematics: 27 (100%)								11 (72)%								
		Electronics: 11 (100%)								15 (100%)								
		Physics: 40 (100%)								15 (93.7%)								
3	Drop-out rates	Biotechnology: 0								0								
		Microbiology: 0								0								
		Botany: 0								0								
		Chemistry: 0								0								
		Computer Science 0								0								
		Mathematics: 0								0								
		Electronics: 0								0								
		Physics: 0								0								
4	No. of students opting for MSc	Biotechnology: 14								23								
		Microbiology: 39								32								
		Botany: 8								12								
		Chemistry: 32								54								
		Computer Science 7								10								
		Mathematics: 20								6								
		Electronics: 3								5								
		Physics: 20								12								
5	Average marks	Biotechnology: 75%								77%								
		Microbiology: 75%								80%								
		Botany: 74.03%								70.43%								
		Chemistry: 89.16%								54.96%								
		Computer Science 75.3%								76%								
		Mathematics: 60%								60%								
		Electronics: 60%								60%								
		Physics: 65%								67.3%								
6	No. of hands-on experiments being conducted	Biotechnology: 90								94								
		Microbiology: 103								109								
		Botany: 176								177								
		Chemistry: 24								27								
		Computer Science 200								201								
		Mathematics: 57								57								
		Electronics: 190								203								
		Physics: 92								92								
7	No. of new	Biotechnology: 0								2								

	experiments introduced	Microbiology:	0	10	
		Botany:	0	1	
		Chemistry:	0	1	
		Computer Science	0	12	
		Mathematics:	0	0	
		Electronics:	3	8	
		Physics:	0	0	
8	Publications (scopus indexed) /patents, if any.	Biotechnology:	0	0	
		Microbiology:	1	1	
		Botany:	1	0	
		Chemistry:	0	0	
		Computer Science	0	0	
		Mathematics:	3	2	
		Electronics:	2	0	
		Physics:	0	0	
9	Training received by faculty	Biotechnology:	0	1	
		Microbiology:	0	2	
		Botany:	0	0	
		Chemistry:	0	2	
		Computer Science	2	3	
		Mathematics:	0	4	
		Electronics:	0	0	
		Physics:	0	2	
10	Exhibitions/seminars /training courses conducted	All Departments	0	2	
		Biotechnology:	2	6	
		Microbiology:	1	9	
		Botany:	0	8	
		Chemistry:	0	9	
		Computer Science	0	5	
		Mathematics:	0	0	
		Electronics:	1	1	
		Physics:	0	1	
11	Books/journals subscribed from grants	Biotechnology:	0	0	
		Microbiology:	3	1	
		Botany:	2	0	
		Chemistry:	0	1	
		Computer Science	0	7	
		Mathematics:	0	46	
		Electronics:	0	0	
		Physics:	0	0	
12	Outreach activities (Popular lectures)	Biotechnology:	0	2	
		Microbiology:	0	5	
		Botany:	0	0	
		Chemistry:	0	4	
		Computer Science	0	0	
		Mathematics:	0	0	
		Electronics:	1	2	
		Physics:	1	2	
13	Colleges mentored to apply for DBT Star College grants				
14	Invited lectures	Biotechnology:	1	8	
		Microbiology:	2	20	
		Botany:	0	0	
		Chemistry:	1	4	
		Computer Science	0	10	
		Mathematics:	0	2	
		Electronics:	1	0	
		Physics:	1	2	

- Proofs (S.No. 6-14 not more than 5 pages, 1.5 line spacing 11 times roman font size) to be provided duly attested by Principal and Coordinator. **(Attached as Annexure)**

10. Self-evaluation

Department	*Objective (as stated in proposal)	%achieved	Reasons for underachievement/If achieved, state in Quantitative metrics
Biotechnology	1. To provide students with basic understanding and hands-on training in molecular biology	100%	2
	2. To provide students with first-hand exposure to an industrial set and spark off entrepreneurship ideas and employment potential through field visits to industries	100%	2
	3. To develop scientific reasoning, scientific writing, hands-on training, and provide opportunities for interactions with experts through seminars, expert talks, and workshops	100%	2
Microbiology	1. To widen the horizons in Microbiology by providing exposure through inter-collegiate events, state-level and national-level seminars	100%	2
	2. To promote hands-on training and strengthen laboratory skills by procuring multiple units of basic instrumentation, introducing new experiments, and preparing laboratory manuals	100%	2
	3. To sharpen basic concepts and calculations in laboratory experimentation by conducting bridge courses in Mathematics and Chemistry essential for biologists	100%	2
	4. To promote industry-academia links through internship programs, on-the-job-training programs, and outstation industry visits	100%	2
	5. To strengthen green technology, consultancy, and extension services by outreach activities to the community	100%	2
Botany	1. To provide opportunities for interactions with experts for skill development in Bonsai through hands-on workshops	100%	2
	2. To promote awareness of plant products through internships and field trips.	100%	2

	3. To impart training in DNA Isolation techniques.	100%	2
Chemistry	1. To sharpen entrepreneurship skills and confidence building by conducting field trips and workshops 2. To train students to qualify for state-level and national-level competitive exams by conducting specific exam training sessions 3. To promote the role of Chemistry in science, technology, and the environment through outreach activities	100% 100% 100%	2 2 2
Computer Science	1. To keep abreast of technological advancements by introducing new experiments using Arduino, Docker, and Python applications 2. To provide hands-on training, problem-solving skills, and research orientation by the conduct of workshops and mini research projects 3. To provide opportunities for interactions with international experts, help develop new ideas, and initiate innovations through seminars and webinars	100% 100% 100%	2 2 2
Mathematics	1. To introduce Smart Boards to improve the teaching pedagogy and learning aspects of mathematics 2. To invite faculty from the research institutions to deliver lectures on mathematical applications to develop critical and analytical thinking 3. To broaden the understanding of mathematics and upgrade the library by the purchase of advanced books	100% 100% 100%	2 2 2
Electronics	1. To provide hands-on training in AC induction motors, Global Positioning systems, Global System for mobile communication, 3G communication, and silicon controller rectifier-based experiments 2. To introduce new UPS, Proportional Integrator Differentiator-based experiments 3. To strengthen electronic	100% 100% 100%	2 2 2

	collaborative learning through outreach activities and lecture sessions 4. To propagate the applications and scope of electronics by conducting workshops	100%	2
Physics	1. To expand students' knowledge and curiosity by conducting lectures, model-making exhibitions, and star-gazing sessions 2. To upgrade the instrumentation skills and scientific proficiency of faculty members through participation in workshops.	100% 100%	2 2

* For quantitative analysis you may fix five objective (max) each having 2 marks and accordingly can calculate the matrix.

Course Coordinator
(With Seal)

PROGRAMME COORDINATOR
DBT STAR COLLEGE SCHEME
ST. XAVIER'S COLLEGE
MAPUSA, GOA.

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Head of the Institution
(With Seal)
PRINCIPAL
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11. **ZBSA Status: (Mark Check Box) as on 31.12.2023**

Not opened ☐ Under process ☐ Opened but not mapped on PFMS ☐ Account is functional ☑

Remarks if, any:

12. **Sanctioned Budget details:**

23/09/2021 to 31/03/2022

(Rs. in Lakhs)

Total Sanctioned Budget	Total Released Budget	Expenditure	Balance as on31.12.2023	Remarks if any
Grants for creation of capital assets (Non- recurring)	60,00,000/-	9,11,579/-	50,88,421/-	
Grants-in-aid General (Recurring)	Recurring - 18,00,000/- Travel - 2,00,000/- Contingency - 1,00,000/-	6,65,211/- Nil 38,016/-	11,34,788.52/- 2,00,000/- 1,61,984/-	
Total	**81,00,000/-**	**16,14,806.48/-**	**64,85,193.52/-**	

01/04/2022 to 31/03/2023

(Rs. in Lakhs)

Total Sanctioned Budget	Total Released Budget	Expenditure	Balance as on31.12.2023	Remarks if any
Grants for creation of capital assets (Non- recurring)	45,95,848/-	45,95,848/-	-	-
Grants-in-aid General (Recurring)	Recurring - 7,20,642/- Travel - 51420/- Contingency - 60,767/-	7,20,642/- 51,420/- 60,932/-	- - (-) 165/-	Bank Charges
Total	**54,28,677/-**	**54,28,842/-**	**(-) 165/-**	

01/04/2023 to 31/12/2023

(Rs. in Lakhs)

Total Sanctioned Budget	Total Released Budget	Expenditure	Balance as on31.12.2023	Remarks if any
Grants for creation of capital assets (Non- recurring)	4,92,572.72/-	4,92,572.72/-	-	
Grants-in-aid General (Recurring)	Recurring – 4,14,147.20/- T – 1,48,579/- C – 1,069/-	4,14,147.20/- 1,48,579/- 1,069/-	- - -	
Total	**10,56,367.92/-**	**10,56,367.92/-**	-	

Course Coordinator
(With Seal)

PROGRAMME COORDINATOR
DBT STAR COLLEGE SCHEME
ST. XAVIER'S COLLEGE
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Head of the Institution
(With Seal)

PRINCIPAL
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Annexure : Key Performance Indicators (2022-2023)

Department	List of Hands-on experiments being conducted
Biotechnology	1. Study of microorganisms, plant and animal cells using microscopes. 2. Isolation of DNA, RNA from eukaryotic and prokaryotic cells.
Microbiology	Determination of phage titre from water/sewage sample.
Chemistry	Melting point of organic derivatives.
Electronics	1) Speed control of AC induction motor using Triac 2. Fully controlled SCR (Silicon Controlled Rectifier) triggering controller kit 3. 3G Communication system trainer kit (Modem interfacing and configuration) 4. Global Positioning System module (Modem interfacing and configuration) 5. GSM (Global System for Mobile Communication) application trainer kit

Department	List of New experiments introduced
Biotechnology	1. Preparation of artificial seeds by gel complexation methods. 2. Study of protein- ligand interaction using Pymol.
Microbiology	1. Demonstration of Synergistic action 2. Determination of Viable Count of Bacteria in Well Water 3. Determination of cell surface hydrophobicity by the BATH Assay 4. Screening for Emulsification activity 5. Study of Effect of Antibiotics on Microbial Growth by Agar Well Method 6. Separation of Amino acid mixture by Circular Paper Chromatography 7. DNA Extraction from Banana 8. Staining of Metachromatic granules 9. Study of bacterial enzyme Amylase 10. Determination of Gram character of bacteria using the KOH method
Botany	Extraction and Estimation of DNA (strawberries) on 10th April 2023
Chemistry	Melting point of organic derivatives.
Computer Science	1. Development of Python Apps. (S.Y.B.Sc.) 2. Kotlin as programming language for mobile application development 3. Use of Python Libraries to implement Machine Learning Algorithms 4. Obstacle avoiding car using Arduino. (T.Y.B.Sc.) 5. Smart Dustbin using Arduino and Ultrasonic Sensor. (T.Y.B.Sc.) 6. Interfacing Flame Sensor with Arduino. (T.Y.B.Sc.) 7. Interfacing 16x2 LCD with Arduino. (T.Y.B.Sc.) 8. Working of Soil Moisture Sensor with Arduino (T.Y.B.Sc.) 9. Automatic Irrigation System using an Arduino Uno. (T.Y.B.Sc.) 10. Introduction to Edge Impulse (T.Y.B.Sc.) 11. Developing React Applications with Firebase and FIGMA. (T.Y.B.Sc.) 12. Introduction to 3-D Printing. (T.Y.B.Sc.)

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Electronics	1. Optical fiber communication trainer kit (optical fiber communication) 2. Stabilizer trainer kit 3. Brushless DC motor training system (constructional features, load characteristics) 4. Three-phase induction motor trainer kit (Break test of induction motor) 5. Human Machine interface (HMI) for Programmable Logic Controller 6. PID (Proportional Integrator Differentiator) controller 7. Solar energy trainer kit (Interfacing of solar panel for lighting application) 8. UPS trainer kit (UPS, assembling & disassembling)

Department	List of Publications (Scopus indexed) / Patents
Microbiology	Malik AD, Furtado IJ (2022). Isolation of *Halomicroarcula pellucida* strain GUMF5, an archaeon from the Dead Sea-Israel possessing cellulase. 3 Biotech, 12(1), 1-11.
Mathematics	1) Lobo Z (2023) Group Analysis of a Hamilton – Jacobi Type Equation. *Journal of Interdisciplinary Mathematics*. 26 (1): 51- 66 2) Lobo Z (2022) Group Analysis of the Second Order Linear Differential Equation with Variable Delay. *Applied Mathematics E-Notes*. 22: 592-601

Department	List of Training received by faculty
Biotechnology	Ms. Jocelyn Fernandes completed the 32 hours online certificate course in 'Recombinant DNA technology' by Uka Tarsadia University from 13-23, Jun 2022
Microbiology	1. Anita Parsekar, completed hands-on workshop on "Operation of Atomic Absorption Spectrophotometer, Total Organic Carbon Analyser, Acoustic Doppler Current Profiler and Epifluorescence Microscope" by Goa University, DST and IIT, Gandhinagar from 23-29 Aug, 2022 2. Siddhesh Menon completed hands-on workshop on "Synergistic Training program utilizing the Scientific and Technological Infrastructure (STUTI)" by BITS Pilani, Shivaji University, Kolhapur from Sep 26-Oct 2, 2022
Chemistry	Ms. Shivta Mhamal and Ms. Flavia Travasso completed a Two-Week Refresher Course in Chemical Sciences conducted by Goa University (26th Jul-08th Aug 2022
Computer Science	1. Ms. Avani Kharde completed a two-week National Level ATAL Faculty Development Programme on "Imaging Spectroscopy and Machine Learning" from 9th to 20th Jan, 2023 organised by Goa University 2. Ms. Sandra Fernandes completed "Problem Solving through Programming in C" course conducted by SWAYAM-NPTEL, during January to April 2023 3. Ms. Prajoti Chimulkar completed "The Joy of Computing using Python" course conducted by SWAYAM-NPTEL, during January to April 2023
Mathematics	1. Mr. Swapnil Belekar completed Two weeks "Refresher Course in Applicable Mathematics" (26 Jul-08 Aug, 2022) by Ramanujan College, University of Delhi 2. Swapnil Belekar completed Online One week FDP on "Quantitative Data Analysis" from 17-23 October 2022 by Ramanujan College, University of Delhi 3. Dr. Jervin Zen Lobo completed a one week on "NEP-2020, New Trends in Higher Education" by Ramanujan College, University of Delhi (29th Aug-4th Sep 2022) 4. Dr. Jervin Zen Lobo completed a one-week FDP on "Academic Administration" by Ramanujan College, University of Delhi, from 6-12th Aug 2022.
Physics	1. X-Ray Crystallography Workshop at Goa University on 21st to 23rd July 2022

	2. "Synergistic Training program utilizing the scientific and technological infrastructure (STUTI)" Workshop at BITS Pilani on 26th Sept to 2nd Oct 2022

Department	List of Exhibitions/seminars/training courses conducted
All Departments	1. "Let's Explore" State-level Workshop for Science students of HSS on 11th January 2023 2. "Emerging Trends in Science and Technology: A Multidisciplinary Approach" National-level Seminar on 3-4th March, 2023
Biotechnology	1. Field trip to CIBA (Centre for Incubation & Business Acceleration) on 06/04/22 2. Field trip to PQS Training Laboratory in Verna, Goa on 07th April 2022 3. Field trip to Parth Prachet Industries, Bethora, Ponda on 12th April 2022 4. Hands-on training at PQS training Laboratory, Verna- Goa on 7th October 2022 5. Field trip to Goa Dairy Plant, Curti, Ponda-Goa on 11th October 2022 6. Field trip to ICAR-CCARI, Ela Old Goa was held on March 17, 202.
Microbiology	1. International webinar series "New Perspectives in life science amidst Covid times" conducted from 17th April 2022 to 19th May 2022. 2. Study trips to NIO, Goa Dairy, and Sewage Treatment, on 20th May 2022 3. Internships: At hospitals, industries and Research Institutes June-July 2022 4. Bridge Course "Chemistry and Mathematics essential for biologists" for TYBSc students from 16 August 2022 to 21st Feb 2023 5. Lecture Series "Life Sciences and Nature" in October 2022 6. Training program at Bioera Pune for TYBSc students in November 2022 7. Hands-on training, basic laboratory techniques (Mini Research Projects) Feb-Jun 2023 8. Study Trip to ICAR-CCARI, Old Goa and Goa Dairy, Ponda on 23rd March 2023 9. Microbiological kitchen waste composting hands-on training on 25th February, 2023
Botany	1. "Know Your Plant" was organized from 21st November 2021 to May 2022 2. Workshop on 'Art of Growing Bonsai' was organized on 16th April 2022. 3. Training on Herbarium Techniques was organized on 9th May 2022. 4. Certificate course on Collection, Isolation and Identification of Microfungi from 27th to 29th June and 1st to 6th July 2022. 5. Certificate course on 'Homemade Herbal Products from 2nd to 8th July 2022. 6. Workshop on mushroom cultivation on 9th November 2022 7. Certificate course on collection, isolation and identification of Micro fungi from 6th to 12th December 2022 8. Lecture series 2022- titled "Global Environmental Crises- Act of Perist from 24th March 2022 to 1st April 2022
Chemistry	1. GU-ART (Goa University Admission Ranking Test) training for T. Y. B. Sc. (Chemistry) on 8th April 2022 by Ms. Ria Colaco and Ms. Samiksha Chodankar. 1. GU-ART (Goa University Admission Ranking Test) training for T. Y. B. Sc. (Chemistry) on 9th April 2022 by Ms. Rowena Almeida (B. Ed.) and Ms. Purva Kinalekar (M. Sc. Part I, School of Chemical Science, Goa University) 2. Inter-Departmental Activity with Microbiology Dept on Antimicrobial activity on 14th March 2023 3. 7th Annual Festival of Innovation: Goa's Young Innovators, a State Level Workshop for school, HSS and College students on 23rd February 2023. 4. Industrial Visit to Glenmark Pharmaceuticals on 26th March 2023. 5. Educational Visit to School of Chemical Sciences, Goa University (23 Sep 2022) 6. Educational Tour to Gujarat from 15th to 20th December 2022.

	7. Workshop on Compression Only Life Support (COLS) for Laboratory & Library staff on 15th February 2023 by Dr. Sandeep Naik and Dr. Gauri Gauns 8. FTIR session on 22nd October 2022 by Dr. Daniel Coutinho 9. Computational Chemistry Hands-on session (11/01/2023): Prof. Rajendra Shirsat
Computer Science	1. Workshop on "UI/UX design" by Mr. Yesh Surve on 10/05/2022 2. Workshop on "Docker", by Ms. Andrea Fernandes on 13/05/2022 3. Workshop "Problem Solving", by Mr. Venkatesh Prabhu on 6th, 13th May 2022 4. Workshop on "3D-Printing", at Rapid Prototyping Lab on 04/04/2023 5. Mini-Projects exhibited to HSS, School children on 10th, 11th January 2023
Electronics	Workshop by Asier Solutions on Internet of Things from June to July 2022.
Physics	Guest Lecture and Model Making Exhibition on 10th March 2023.

Department	List of Books / Journals subscribed from grants
Microbiology	Brock Biology of Microorganisms, 16th edition : Madigan, Buckley and Stahl.
Chemistry	Practical guide and spectral atlas for interpretive Near-Infrared Spectroscopy, 2nd edition. Jerry Workman Jr., Lois Weyer.
Computer Science	1) Artificial Intelligence: Stuart Russell, Peter Norvig. 2) R for Everyone: Jared P. Lander. 3) Machine Learning With Python for Everyone: Mark E. Fenner. 4) New Perspective Microsoft Office 365 And Excel 2019: Patrick Carey. 5) Big Data – Second Edition: Anil Maheshwari. 6) Python For Programmers: Paul Deitel, Harvey Deitel. 7) Data Visualization Exploring and Explaining With Data: Camm et al.
Mathematics	1. Differential Calculus, Hari Kishan 2. Functional Analysis, M Haase 3. Set Theory, V Kakkar 4. A Guide to Plane Algebraic Curves, Kending 5. Mathematical Techniques for Competitive Exams, S Das 6. A Course in real Analysis, M Mukherjee 7. Problems in Real & Functional Analysis, Torchinsky 8. A Course on Abstract Algebra, Eie Chang 9. A Course on Abstract Algebra, Eie Chang 10. Modern Algebra, Bhushan Kumar 11. Modern Algebra, Bhushan Kumar 12. Problems and solutions in Mathematics, Li 13. Complex Analysis: An Invitation, Rao 14. A Graduate Course in Algebra, Farmakis 15. Effective Python, Slatkin 16. Introduction to Analysis with complex numbers, Ivena Swanson 17. Introduction to Analysis with complex numbers, Ivena Swanson 18. Exploration in Numerical Analysis, Lombers 19. Calculus- Early Transcendentals, Stewart 20. Calculus- Early Transcendentals, Stewart 21. Thomas' Calculus, Hass, Hell, Weir 22. Thomas' Calculus, Hass, Hell, Weir 23. Elementary linear Algebra, Anton, Rorrer 24. Linear Algebra: Pure and Applied, Goodajre

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	25. Analysis and Beyond, Kenemitsu, Kuzumaki 26. Lectures on Differential Geometry, Chern Chen 27. Applied Numerical Method using MATLAB, Dukkipati 28. Introduction to MATLAB 7, Etter Kuncicky 29. Python Distilled, Bearley 30. Lebesgue Measure and integration, Jain Gupta 31. Functional Analysis, Balmohan Limaye 32. Theory of Bases in Banach Spaces, Jain 33. A First Course in Partial Differential Equation, Buchanon 34. Challenge and thrill of pre-College Mathematics, V. Krishnamurthy 35. Problems in linear algebra and Matrix theory, Fuzen Zhang 36. General Knowledge Manual, Thorpe 37. Topology, Munkres 38. Functional Analysis, Jain, Ahuja 39. Research Methodology Methods and Techniques, C. R. Kothari 40. Applied Numerical Methods using MATLAB, Dukkipati 41. A first course in Partial Differential Equations, Buchanan, Shao 42. Statistics for Business and Economics, Anderson 43. Business Analytics, Evans 44. Vector Geometry and Elements of Calculus, Dey 45. Discrete Mathematics with Applications, Epp 46.An Introduction to Differential Equations with Applications, Cohen, Gallup

Department	List of Outreach activities (Popular lectures)
Biotechnology	1. An Open day for High Schools of North Goa on 10th January 2023. 2. Talk: Biotechnology-A bridge to the future for HSS Sci students on /8/01/23
Microbiology	1. "Explore the world of Microbiology" (01/07/2022) workshop for HSS 2. "The Fascinating World of Microbiology" at the Government Middle School, Mapusa on 28th February 2023 3. "Microfermentors" at Shri Ganesh Vidhya Mandir, Mapusa on 28/02/2023 4. "The Fascinating World of Microbiology" at Keerti Vidyalaya High School, Siolim on 28th February 2023 5. "Microbiology as a career option/ an option for higher studies" Outreach Programme for Higher Secondary Schools on 28th February 2023
Chemistry	1. 'Latest Trends in Science and Career Opportunities available especially in Pharma sector', on 21/09/2022 at Purushottam Walawalkar (Saraswat) HSS 2. 'Recent advances in Science and Technology', on 17th September 2022 at Diogo Vaz Higher Secondary School, Colvale 3. 'Recent advances in Science and Technology' on 17th October 2022 at St. Xavier's Higher Secondary School, Mapusa-Goa. 4. "Yuvavani" Programme at All India Radio recorded on 29th May 2023
Electronics	1. The Amazing World of Electronics on Collaborative Learning Cafe delivered by Mrs Vilma M. T. Fernandes on 24th July 2022 2. An Open day for High Schools of North Goa on 10th January 2023
Physics	1. Guest Lecture and Model Making Exhibition on 10th March 2023 2. Sky Gazing Program on 31st March 2023

Department	List of Invited Lectures
Biotechnology	1. Career Guidance on Forensic Science (07/05/2022) by Ms. Glorita Fernandes 2. Career Guidance on Scientific Writing (07/05/2022) by Mr. Lino Cardoz 3. 'Cyber Security' by Mr. Amber Kamat, on 13th May 2022 4. Interactive session on the topic 'Polycystic Ovary Syndrome (PCOS)' for staff and students on the 24th of May 2022 by Dr. Emanuel Gracias 5. 'Fungi: The good & not always good' by Mr. Miguel Braganza, Consultant at Botanical Society of Goa on the 11th October 2022 6. 'Microbiology & Marine environment' by Dr. Varada Damare (15/10/2022) 7. 'Seaweed Holobionts: Bioprospecting and their Regulation' by Dr. Sanjeev Ghadi on the 19th October 2022 8. 'Oceans as reservoirs of genes' Dr. Samir Damare on the 20th October 2022
Microbiology	1. "Smart Money Management" by Ms. Marilyn Pinto on 5th December 2022 2. "Scope of Bioinformatics" by Ms Pratibha Kadam on 25th March 2023 3. 'Biomimetics' by Dr. Savita Kerkar on 11th October 2022 4. 'Microbiology of Crude Salt Crystals' by Dr. Bhakti Salgaonkar (02/10/22) 5. 'Agro Tourism' by Dr. R. Solomon Rajkumar on 13th October 2022 6. 'Life Sciences Around Us' by Dr. Elroy Pereira on the 14th October 2022 7. Birth Defects: Superstitions, Myths and Facts: Dr. Nandini Vaz (17/10/22) 8. 'Biogeochemistry of Carbon- The Arctic Connect' Dr. Anand Jain (17/10/22) 9. 'Microbial Colonization In The Rapidly Retreating Glaciers' by Dr. Venkatachalam S. on the 17th October 2022 10. 'Infectious Diseases' by Dr. Amit Dias, Lecturer, GMC on 17th October 2022 11. "Bioinformatics: Interface between Biology and Computer Science" Dr. Samir Damare, NIO on the 7th April 2022 12. "Bridging Immunology and Genomics to Fight Cancer" by Dr. Nicolette Fonseca, Canada on the 8th April 2022 13. "Recombinant Bovine Adenoviral Vaccine for Tuberculosis" by Dr. Abhishek Mishra, Texas, USA on the 9th April 2022 14. "Career Opportunities in Biopharmaceutical Industry" by Mr. Bhausaheb Patil, UK on the 12th April 2022 15. "Global Warming and Microbes" by Dr. Archana Mudbidri, USA (26/04/2022) 16. "Microbes in Earth's Icy World: Tiny Cells, Huge Impact" by Dr. Runa Antony, Germany on the 28th April 2022 17. "Integration of Nanotechnology and Polymer Science for Development of Antimicrobial Polymers" by Dr. Trupti Gokhale, Dubai, UAE (29th April 2022) 18. "Cerebral Evolution: The Ascent of Intelligence" by Dr. Momna V. Hejmadi, University of Bath, UK on the 19th May 2022 19. Genetically Modified Foods- Pros and Cons: Dr. AM. Deshmukh (05/05/2022) 20. "Leveraging your Research Experiences for Life beyond a Bachelor's Degree" by Dr. A. M. Deshmukh on 7th May 2022
Chemistry	1. Food Fraud vs Food Safety Hands on Training Session on 29th October 2022 by Mr. Richard Noronha and Mr. Darlan Diukar 2. Career Prospects in Chemistry on 27th January 2023 by Mr. Sagar Desai 3. Webinar on Computational Chemistry (13/10/2022) by Dr. Anant D. Kulkarni 4. Webinar on Computational Chemistry (15/10/2022) by Mr. Vishnu Chari
Computer	1. "Introduction to Power BI" by Mr.Selwyn D'Souza, New Zealand (07/05/2022)

Science	2. "Good Design, Bad Design and Usability" by Mr. Sylvan Lobo on 09/05/2022 3. "Power Platform" by Ms. Lee-ann Dias, Australia on 11/05/2022 4. "Basics of Rest API" by Ms. Lucia Rodrigues, Zimbabwe on 13/05/2022 5. Introduction to Blockchain Technology: Mr. Jonathan Fernandes (02/03/2023) 6. "The Setting of the Dishtavo Studio" by Mr. Daryl Pereira on 31/03/2023 7. Postgraduate education avenues at Goa Business School: Mr. H. Redkar on 31/03/2023 8. "Natural Language Processing" by Mr. Venkatesh Prabhu on 31/03/2023 9. "GIMS and the education it provides" by Mr. Vithal Sukhtankar on 03/04/2023 10. "Incubation & Innovation at Forum for Innovation Incubation Research and Entrepreneurship (FiiRE)" by Mr. Kiraan Mehta on 04/04/2023
Mathematics	1. Guest Lecture on "Estimation on Primes and its Applications" on 1st March 2023 2. Talk on "Irrationality of pi and e and some applications" on 20th March 2023.
Physics	1. Lecture Series in Physics on 28th January 2023. 2. Guest lecture by Prof. Arun Kulkarni, BITS Pilani on 10th March 2023.

Course Coordinator
(With Seal)

PROGRAMME COORDINATOR
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