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: **23/09/2021 to 31/03/2022** Duration in years: **0.5 years (6 months)**

4. Details of Departments Supported

S. No	Name of Department	Courses (B.Sc./M.Sc./PG Diploma,certificate etc.) offered	Regular Faculty members	
			Total = 55	
			With Ph.D. = 22	Without Ph.D. =33
1	Biotechnology	B.Sc.	Nil	Nil
	Microbiology	B.Sc.	04	06
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	03

5. Number & Date of Advisory committee meeting:

S. No.	Nature	Date	Participants
1	Internal Advisory Committee Meeting (contact mode)	18th December 2021	Local Advisory Committee members
2	Internal Advisory Committee Meeting (contact mode)	21st March 2022	Local Advisory Committee members
3	**External Advisory Committee (online mode)**	**23rd March 2022**	**Programme Officer, External Subject Experts, Local Advisory Committee Members**
4	Internal Advisory Committee Meeting (contact mode)	26th March 2022	Local Advisory Committee members

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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. **Upgrade of Laboratory Infrastructure**

   Laboratory infrastructure was upgraded in all 8 beneficiary departments. The availability of additional consumables, glassware, and equipment facilitated the conduct of experiments individually by students instead of the group experiments that were being carried out pre-support. Hands-on exposure to lab work increased also due to the availability of multiple units of the new instruments.

2. **Strengthening of Existing Curriculum**

   Theoretical concepts that were difficult to comprehend now became clear to students as related practicals were introduced. Add-on courses, workshops, seminars, guest lectures, and field trips became affordable to all science departments making the teaching-learning process more interactive and practical-oriented.

3. **Stimulation of Scientific Curiosity**

   The mini-research projects carried out with the help of DBT support helped foster student curiosity. Undergraduate students got first-hand exposure to basic scientific article writing and scientific poster presentations.

4. **Skill enhancement for staff members**

   The skill enhancement for staff members was given a boost. Teaching and non-teaching staff members of all beneficiary departments participated in training and skill development programmes to keep abreast with current trends. Scientific reading and writing were promoted.

5. **Popularization of Outreach Activities**

   Interaction with school students and engagement with community became popular. Several

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outreach programmes were conducted on significant scientific topics and the scope of higher studies in science.

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

1. **Interdepartmental Science Exhibition "Innovations and Latest Trends in Science"**

   The students from all 8 beneficiary departments displayed innovative models, posters, and demonstrations. The whole event was filmed for dissemination via social media. The activity created a platform for students to showcase their innovative ideas through models, posters, and demonstrations and broaden their scientific curiosity and scientific imagination. The activity facilitated additional reading beyond syllabi, contributed to the understanding of scientific concepts, and rendered greater confidence in presentation and communication skills.

2. **Mini Research Projects "Nurturing Scientific Curiosity"**

   The Department of Microbiology conducted mini-research projects for their second year students. The students were trained on how to carry out a literature survey, identify a problem, put forth a hypothesis, devise protocols, plan laboratory work, compile results, analyze, and infer. Students prepared their own media and requirements, sterilized their own glassware and carried out the practical work as per the protocol. At the end of the laboratory work the students were trained to document their findings. The activity helped in the inculcation of scientific temperament and organization skills. The research-based pedagogy facilitated enquiry-based experiential learning, promoted critical thinking, and encouraged students to assess outcomes, make hypotheses, and draw conclusions. The projects also increased hands-on experimentation and helped build more confidence in operation and handling of instruments.

3. **Summer School in Linear Algebra**

   The objective of this programme organised by the Department of Mathematics was to review and learn some advanced linear algebra concepts that would help participants qualify various entrance and competitive examinations in mathematics. The students were able to recall basic algebra and understand the significance of advanced algebra, such as, polynomial and minimal polynomial of a matrix, eigen vectors, and diagonalization of matrices.

4. **Add-on Course "Artificial Intelligence, Robotics, Internet of Things"**

   The Department of Electronics organised a 12-weeks add-on course where the students

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received hands-on training in recent technologies, such as, IOT, Cloud Computing, Robotics, Artificial Intelligence and Machine learning.

5. **Workshop on Mushroom Cultivation**

The Department of Botany organised a Hands-on training workshop on Mushroom cultivation. The students were briefed on the nutritional benefits of mushrooms and the technique of cultivation of Oyster mushrooms (*Pleurotus sajor-caju*) and shown how they could grow the mushroom at home on their own. The activity helped inculcate innovative ideas of entrepreneurship and self-employment, provided hands-on training, and opened new and sustainable avenues for independent set-ups.

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

Novel aspects introduced

- Mini research projects for second-year students to stimulate their scientific curiosity and strengthen their research and organization skills
- Outreach activities such as awareness drives on "Prevention of diseases spread due to floods" in flood-affected areas of North Goa, hands-on training in fermentation technology, demonstration lectures on Mushroom Cultivation, and talks on "Role of Modern Biotechnology in Sustainability by the Departments of Microbiology, Botany, and Biotechnology aided in the generation of public awareness towards basic yet significant scientific aspects in everyday life.
- An increase in interdisciplinary and interdepartmental activities, such as workshop on "Biosafety and Laboratory Waste Management" organised by all 8 beneficiary departments for teaching and laboratory staff members, Lecture Series "Frontiers in Life Sciences" organised by the Departments of Microbiology and Biotechnology, Science Exhibition on "Innovations and Latest Trends in Science" organised by all 8 beneficiary departments, Workshop on the working of analytic instruments organised by the Department of Chemistry in coordination with the Departments of Electronics, and Physics, and the session on "Introduction to Computational Chemistry" organised by the Department of Chemistry in coordination with the BCA department showcased the coming together of all 8 beneficiary departments to broaden the horizons of quality education opportunities for the students.

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Novel aspects planning to introduce

- Journal Club for third-year students to expose them to recent research trends and inculcate scientific reasoning
- Promotion of science in schools through student-driven outreach programmes
- Design of SOPs and Laboratory manuals to facilitate laboratory learning and instrumentation handling.

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

- The DBT grant reinforced the importance of hands-on experiments to expand student knowledge, stimulate critical thinking in them, and more so increase their confidence to venture out independently and follow their dreams.
- The importance of interdisciplinary and multi-disciplinary approaches of imparting science education was greatly appreciated and widened the teaching-learning spectrum and enabled the development of innovative ideas amongst the students.
- The unavailability of guidance and streamlined protocols for using the PFMS portal caused unnecessary delays due to the inevitable trial-and-error approach of making payments.

9. **Key performance indicators**

S. No	Indicator	Pre-support (2020-2021)								During /After Support (2021-2022)								Remarks
1	No. of students admitted	Total = 224								Total = DBT support came in Sept 2021, admissions for the academic year were complete before that.								
		M= 70				F= 154				M=				F=				
		SC 0	ST 0	OBC 15	G 55	SC 5	ST 1	OBC 47	G 101	SC	ST	OBC	G	SC	ST	OBC	G	
2	No. of students passing out (%) Students Admitted/passing out (pass %)	Biotechnology: 16 (100%)								25 (100%)								
		Microbiology: 75 (100%)								69 (94.8%)								
		Botany: 20 (100%)								12 (100%)								
		Chemistry: 80 (100%)								80 (100%)								
		Computer Science 26 (100%)								19 (95%)								
		Mathematics. 27 (60%)								12 (83%)								
		Electronics: 11 (100%)								10 (100%)								
		Physics: 40 (100%)								24 (100%)								

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	18	
		Microbiology:	39	30	
		Botany:	8	1	
		Chemistry:	32	54	
		Computer Science	7	11	
		Mathematics:	20	11	
		Electronics:	3	5	
		Physics:	20	12	
5	Average marks	Biotechnology:	75%	75%	
		Microbiology:	75%	75%	
		Botany:	74.03%	77.51%	
		Chemistry:	89.16%	67.08%	
		Computer Science	75.3%	77.95%	
		Mathematics:	60%	60%	
		Electronics:	60%	60%	
		Physics:	65%	67%	
6	No. of hands-on experiments being conducted	Biotechnology:	90	92	
		Microbiology:	103	108	
		Botany:	176	177	
		Chemistry:	24	26	
		Computer Science	200	201	
		Mathematics:	57	57	
		Electronics:	190	198	
		Physics:	92	92	
7	No. of new experiments introduced	Biotechnology:	0	0	
		Microbiology:	0	2	
		Botany:	0	1	
		Chemistry:	0	2	
		Computer Science	0	5	
		Mathematics:	0	0	
		Electronics:	3	11	
		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	1	
		Physics:	0	0	
9	Training received by faculty	Biotechnology:	0	4	
		Microbiology:	0	17	
		Botany:	0	0	
		Chemistry:	0	3	
		Computer Science	2	2	
		Mathematics:	0	3	
		Electronics:	0	10	
		Physics:	0	0	
10	Exhibitions/seminars /training courses conducted	All Departments	0	3	
		Biotechnology:	2	5	
		Microbiology:	1	2	

		Botany:	0	5	
		Chemistry:	0	11	
		Computer Science	0	1	
		Mathematics:	0	3	
		Electronics:	1	1	
		Physics:	0	3	
11	Books/journals subscribed from grants	Biotechnology:	0	2	
		Microbiology:	3	0	
		Botany:	2	5	
		Chemistry:	0	3	
		Computer Science	0	15	
		Mathematics:	0	10	
		Electronics:	0	2	
		Physics:	0	10	
12	Outreach activities (Popular lectures)	Biotechnology:	0	1	
		Microbiology:	0	3	
		Botany:	0	1	
		Chemistry:	0	0	
		Computer Science	0	0	
		Mathematics:	0	0	
		Electronics:	1	1	
		Physics:	1	0	
13	Colleges mentored to apply for DBT Star College grants				
14	Invited lectures	Biotechnology:	1	1	
		Microbiology:	2	4	
		Botany:	0	0	
		Chemistry:	1	3	
		Computer Science	0	1	
		Mathematics:	0	1	
		Electronics:	1	1	
		Physics:	1	0	

- 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 instrument knowledge and hands-on training in conductance and potentiometry	100%	2
	2. To showcase the scope of biotechnology through conduct of workshops, seminars, and field trips to industries	100%	2
	3. To upgrade faculty skill development in molecular biology and recombinant DNA technology through certificate courses and training workshops	100%	2
Microbiology	1. To develop critical thinking skills by providing	100%	2

	opportunities for interactions with experts and microbiologists through seminars and webinars. 2. To provide opportunities for skill development and research orientation through hands-on-training workshops and mini research projects 3. To promote green technology through awareness drives on waste management 4. To inculcate entrepreneurship initiatives in agriculture and fermentation technology amongst students by introducing new industry-based experiments and hands-on training workshops 5. To upgrade faculty skill development in molecular biology, recombinant DNA technology, and bioinformatics through certificate courses and training workshops	100% 100% 100% 100%	2 2 2 2
Botany	1. To conduct hands on training in the field of mycology, mycorrhizal techniques and herbal technology. 2. To promote entrepreneurship using herbal product preparation and mushroom cultivation. 3. To sensitize students regarding the utility of the plants around us	100% 100% 100%	2 2 2
Chemistry	1. To provide basic understanding of recording and interpretation of IR spectroscopy by the inclusion of new experiments and purchase of books in IR spectroscopy 2. To provide hands-on training and troubleshooting in IR spectroscopy 3. To widen employment opportunities in Chemistry through the conduct of interdisciplinary and interdepartmental activities 4. To upgrade the chemical preparation and solution storage skills of the laboratory staff through the conduct of training sessions	100% 100% 100% 100%	2 2 2 2
Computer Science	1. To provide hands-on training and skill development of various programming languages by the conduct of new data analysis, visualization, and simulation practicals 2. To improve the library facilities by the purchase of new books and promoting advanced knowledge, understanding, and foundation concepts 3. To prepare students for ready employment in the IT industry through the conduct of workshops and lecture sessions 4. To enhance faculty skill development through training courses in machine learning and computer applications	100% 100% 100% 100%	2 2 2 2
Mathematics	1. To introduce the mathematical software MatLab for students and faculties which will help them in their research work. 2. Summer training in mathematics for students and faculty members to upgrade their understanding of some concepts in Linear Algebra. 3. Hands-on training on the open-source software LaTex, to prepare a scientific documentation. 4. Educational Tour for T.Y.B.Sc Mathematics	100% 100% 100% 100%	2 2 2 2

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	students to explore the hidden beauty of mathematics. 5. To upgrade skills of the faculty members in Mathematics and Statistics by participation in Faculty Improvement Programmes	100%	2
Electronics	1. To promote hands-on training in solar energy trainer, UPS, Optical fibre, Laser fibre, glucometer, pulse oximeter, pacemaker simulator, and super heterodyne receiver-based experiments and purchase of multiple units of basic instruments	100%	2
	2. To widen the practical exposure of students by the conduct of new experiments using Programmable Logic Controller and purchase of new instrumentation	100%	2
	3. To conduct hands-on training in IOT, Robotics, Artificial Intelligence and Machine Learning.	100%	2
	4. To upgrade skills of the faculty members in DCS, signal processing, machine learning, and recent trends through Faculty development programmes	100%	2
	5. To promote the applications of electronics through the conduct of interdisciplinary and interdepartmental activities	100%	2
Physics	1. To broaden the understanding of physics amongst students by the purchase of advanced interdisciplinary books in physics	100%	2
	2. To showcase the scope of physics through conduct of field trips to various institutes	100%	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
ST. XAVIER'S COLLEGE
GOA

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
STAR COLLEGE SCHEME
ST. XAVIER'S COLLEGE
MAPUSA, GOA.

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Head of the Institution
(With Seal)
PRINCIPAL
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Annexure : Key Performance Indicators (2021-2022)

Department	List of Hands-on experiments being conducted
Biotechnology	1. Determination of cell constant and conductance using conductometer. 2. Determination of solute concentration by potentiometry.
Microbiology	1. Viable Count (CFU) by Spread plate method 2. Determination of Thermal Death Time and Decimal Reduction Time of *E. coli* 3. Standard Plate Count of milk samples 4. Effect of Transcription/replication/protein synthesis inhibitors (paper disk) 5. Bioassay of Penicillin
Botany	1. Isolation Technique of AM fungal Species and also trapping AM fungal
Chemistry	1. Recording and interpretation of IR spectra of organic compounds. 2. Recording and interpretation of IR spectra of inorganic complexes.
Computer Sc.	1. Simulation practicals were done using NS2 with Tcl as the scripting interface.
Electronics	1. Solar energy trainer kit (Interfacing of solar panel for lighting application). 2. UPS (Un-interrupted Power Supply) trainer kit (assembling and disassembling) 3. Optical fiber communication trainer kit (Bio-Medical transducers) 4. Laser fiber optic trainer (Bio-Medical application using transducer I) 5. Glucometer Trainer kit (Bio-Medical Glucometer experiment) 6. Pulse Oximeter Trainer kit (Oximeter experiment) 7. Pacemaker Simulator Trainer kit (Cardiac Pacemaker experiment) 8. Super heterodyne receiver kit (Study of Super heterodyne radio receiver)

Department	List of New experiments introduced
Microbiology	1. Preparation of PGPR/ organic manure and testing the efficacy on plant growth 2. Microbial fermentation - probiotic drink (fruit-flavored kombucha)
Botany	1. Isolation Technique of AM fungal Species and trapping AM fungal inoculum
Chemistry	1. Recording and interpretation of IR spectra of organic compounds. 2. Recording and interpretation of IR spectra of inorganic complexes.
Computer Science	1. Use of Pandas Library to perform basic Data Analysis such as data cleaning 2. Use of Matplotlib Library to visualize data using Histogram, Bar Graph, Pie Chart, Scatter Plot, Line Graph (S.Y.B.Sc.) 3. Use of Numpy Library to create matrices and perform basic matrix operations 4. Introduction of GITHUB (S.Y.B.Sc.) 5. Introduction to Docker (T.Y.B.Sc.)
Electronics	1. FSK (Frequency Shift Keying) trainer kit (Generation of FSK) 2. BPSK (Binary Phase Shift Keying) trainer kit (Generation of PSK) 3. Laser fiber optic trainer (Bio-Medical application using transducer I) 4. Super heterodyne receiver kit (Study of super heterodyne radio receiver) 5. Linear Variable Displacement Transducer kit (LVDT displacement sensor) 6. Glucometer Trainer kit (Study of Bio-Medical Glucometer) 7. Pulse Oximeter Trainer kit (Study of Oximeter) 8. Pacemaker Simulator Trainer kit (Study of Cardiac Pacemaker) 9. Microprocessor kit with interfacing card

	10. Interfacing card for Programmable Logic Controller (ON-OFF type) (interfacing to PLC: sensor, relays, push buttons, source and sink concept) 11. Interfacing card for (Programmable Logic Controller) (Analog type)

Department	List of Publications (Scopus indexed) / Patents
Microbiology	Naik, M. M., Imran, M., Vaigankar, D. C., Mujawar, S. Y., Malik, A. D., & Gaonkar, S. K. (2021). Genome Guided Bioprospecting of Extremely Halophilic *Haloferax* sp. AS1 for CAZymes, Bioremediation and Study Metabolic Versatility. Proceedings of the National Academy of Sciences, India Section B: Biological Sciences, 1.
Mathematics	1) Lobo Z (2022) Symmetry Analysis of the Korteweg-de Vries Equation. *Palestine Journal of Mathematics*. 11 (1):1-12 2) Lobo Z, Valaulikar YS (2021) Group Methods for Second Order Delay Differential Equations. *Turkish World Mathematical Society Journal of Applied and Engineering Mathematics*. 11 (4):1194 -1206
Electronics	Pinto, C.F.; Parab, J.S.; Sequeira, M.; Naik, G.M. (2022) Improving Hemoglobin Estimation accuracy through Standardizing of LED Power. IJECE. 12 (1) 219-228

Department	List of Training received by faculty
Biotechnology	Four faculty members attended an online National level Certificate course on "Recombinant DNA technology" from 13th Feb. to 23rd Feb. 2022.
Microbiology	1. Five faculty members attended an online National level Certificate course on "Recombinant DNA technology" from 17th to 28th January 2022 2. Twelve faculty members attended an International Conference "Biological Innovations and computational exploration for pandemic challenges" organized by the Departments of Biotechnology and Bioinformatics, Bishop Heber College (Autonomous), Tamil Nadu, from 24th to 25th February 2022.
Chemistry	Three Faculty completed 30 hours Certificate course in 'Research Methodology in Chemical Sciences' conducted by St. Agnes College (Autonomous), Mangaluru
Computer Science	1. Ms. Avani Kharde completed ATAL Academy Online Elementary FDP on "Machine Learning Applications on Image Processing" from 17/01/2022 to 21/01/2022 at Nagarjuna College of Engineering and Technology 2. Ms. Avani Kharde completed Two Week Refresher Course in "Computer Science" from 02-16 May, 2022 organized by Teaching Learning Centre in collaboration with Ramanujan College, University of Delhi.
Mathematics	1) Mr. Swapnil Belekar participated in 113th Faculty Induction Programme from 01-02-2022 to 09-03-2022 organized by Goa University 2) Mr. Rahul Naik participated in 110th Faculty Induction Programme from 03-08-2021 to 06-09-2021 organized by Goa University 3) Dr. Zen Lobo completed Refresher Course on Mathematics & Statistics (Pure and Applied) organized by Gauhati University, from 24/01/2022 – 07/02/2022
Electronics	1. Four faculty members participated in the ATAL FDP titled, "DCS – Switching and Routing", from January 17th to 21st Jan, 2022, in Computer Networking, Electrical and Computer Engineering form Goa University

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	2. Dr. Noel Tavares participated in the ATAL FDP "Signal Processing for Cognitive Neuroscience applications" from 17th to 21st Jan, 2022 in Biomedical Signal processing, Electrical and Computer Engineering from NIT, Meghalaya 3. Mr. Caje Pinto participated in the ATAL FDP titled, "Recent Trends and Advancements in ANN and Deep learning for Real Time Applications" from 20/12/21 to 24/12/21 at Rungta College of Engineering and Technology, Bhilai. 4. Caje F. Pinto: SkillUP online course on "Machine Learning" on 18/08/2021 5. Caje F. Pinto: SkillUP online course on "Deep Learning" on 21st August, 2021 6. Caje F. Pinto: SkillUP online course on "Introduction to IOT" on 30/08/2021 7. Caje Pinto: SkillUP course on "Programming with Python 3.X" on 23/08/2021

Department	List of Exhibitions/seminars/training courses conducted
All Departments	1. Online Interdisciplinary workshop for all science faculty on the topic 'Biosafety and Laboratory Waste Management' 10th January 2022. 2. Interdisciplinary Training for Laboratory Staff "Biosafety and Laboratory Waste Management" on 19th March 2022. 3. Science Exhibition on "Innovations and latest trends in Science" organized by IQAC and DBT on 17th May 2022
Biotechnology	1. Exhibition 'Flora' on the theme Plants in our day-to-day life on 17/12/2021 2. Exhibition 'Agri-Tech' on Technology innovation in agriculture on 17/12/2021 3. National Science Day Lecture Series "Frontiers in Life Sciences" in association with the Department of Microbiology on 12th and 21st March 2022. 4. International Webinar on 'Maintaining Optimal Oral Health Care' in association with the Department of Microbiology and Health Club on 19th March 2022. 5. Field trip to Raika Honey Apiary Bee nursery and training center, Benaulim and Goa Chitra, an ethnographic museum on 30th March 2022.
Microbiology	1. National Science Day Lecture Series "Frontiers in Life Sciences" in association with the Department of Biotechnology on 12th and 21st March 2022. 2. Workshop on "Biostatistics – Principles and Practical Uses In Biology" by Dr. Roshan Naik on 24th and 26th March 2022
Botany	1. Certificate Course on "Collection, Isolation and Identification of Microfungi" 2. Certificate Courses on "homemade Herbal Product." 3. "Know Your Plant" was organized from 21st November 2021 to May 2022 4. Lecture series: Exploring fungal diversity for its immense potential (14/03/22) 5. Workshop on mushroom cultivation was organized on 26th March 2022
Chemistry	1. Inter-Departmental Activity with Electronics Dept: Workshop on working of analytical instruments on 19th March, 2022 2. Inter-Departmental Activity with Physics Dept: Workshop on working of analytical instruments on 19th March, 2022 3. Interdisciplinary Activity with BCA Dept on 'Introduction to Computational Chemistry' on 17th March 2022 4. 6th Annual 'Festival of Innovations: Goa's Young Innovators', a state-level workshop (online) for School, HSS and College students on 30th April 2022

	5. International Webinar on "Nanotechnology and Material Science" on 28th and 29th March 2022. 6. National Webinar: New Trends in Analytical Techniques on 30th March 2022. 7. Industrial Visit to Ashutosh Industries, Mardol-Ponda on 24th March 2022. 8. IR Spectroscopy-Students Training on 19th March 2022 9. XRD Training on 14th May 2022 10. UV-Visible Spectroscopy Training on 30th April 2022 11. Training for Laboratory staff: Preparation of Laboratory Solutions and Storage on 19th March 2022
Computer Sc.	Workshop on Introduction to docker on 19/03/2022
Mathematics	1. Educational Tour for T.Y.B.Sc Mathematics students 2. Faculty Enrichment Programme: Multivariable Calculus on 08/12/2022 3. Technical Typesetting using LaTeX (30 Hours).
Electronics	Artificial Intelligence, Robotics, Internet of Things" 12 weeks (36 hours session) from 19th March to12th July 2022 by Asier Solutions (OPC) Pvt. Ltd, Margao, Goa
Physics	1. Study visit to Goa University, Physics Department on 17th March 2022. 2. Study visit to NCPOR Vasco Goa on 30th March 2022. 3. Study visit to ICAR-CCARI Old Goa on 8th April 2022.

Department	List of Books / Journals subscribed from grants
Biotechnology	1. Concepts of Genetics, William S. Klug, Michael R. Cummings, Charlotte A. Spencer, Michael A. Palladino, Darrell Killian, 11th Edition, Pearson. 2. Textbook of Medical Physiology, Gyton and Hall, 14th Edition, Elsevier.
Botany	1. Plant propagation, Principles and Practice. 2. The Complete Technology Book on Biofertilizer and Organic Farming. 3. Medicinal and Aromatic Plants. 4. Floriculture in India. 5. Handbook of Microbial Fertilizers
Chemistry	1. Infrared spectra of Inorganic and Coordination Compounds, Kazuo Nakamoto, 2nd edition, John Wil 2. Modern Spectroscopy, J. Michael Hollas, 4th Edition 3. Fundamentals of Fourier Transform Infrared Spectroscopy, Brian C. Smith, 2nd edition
Computer Science	1. Data Science Fundamentals and practical approaches: G.Anand, R.Sharma 2. Mastering Machine Learning on AWS: Advanced Machine Learning in Python using Sagemaker, Apache Spark & Tensor Flow: SSR Mengle, M Gurmendez 3. AI & ML – Powering the agents of Automation : Deepika/ Vijay/ Amitendra. 4. Blockchain – From Concept to Execution : Debajani Mohanty. 5. Data Analysis with Excel : *Manisha Nigam.* 6. *Machine Learning with Python : Abhishek Vijayvargia* 7. *Practical Approach for Machine Leadership and Deep Learning Algorithms* Pandey/ Rathore/ Balamurugan. 8. Advanced Analytics with Excel 2019 : Manisha Nigam. 9. Hands on Cloud Analytics with MS Azure Stack : Prashila Naik. 10. Artificial Intelligence & Deep Learning for Decision Makers: *J Kaur/N S Gill.*

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	11. Artificial Intelligence for Managers. 12. Data Science Fundamentals and Practical Approaches : *Nandi/Sharma.* 13. Fundamentals of *Deep Learning and computer vision:* N Singh, P Ahuja. 14. IOT Based Project : Singh/ Gehlot/ Gupta/Swain. 15. Practical Full stack Machine Learning : Alok Kumar.
Mathematics	1. Basic Multivariable Calculus, Marsdend, J 2. A Walk-Through Combinatorics, Bona, Miklos 3. A beginners Guide to Mathematics, McMohan, David 4. A Guide to MATLAB, for Beginners & Expefrienced Users, Hunt 5. Intermediate Mathematical Analysis, Bhatt R D 6. First step in LaTeX, Gratzer G 7. Mathematics, 3000+ Questions, IIT JAM, Choudhary K 8. How to Prepare for Quantitative Aptitude for CAT, 10e, Sharma A 9. Elementary & Advanced Mathematics for Competitive Exams, Mishra PK 10. Mathematics for JEE Main & Advanced XII. Arun Kala. Cengage Learning India
Electronics	1. Mastering Windows Server 2012 R2, Publisher by Hynes Publisher Sybex 2. Practical modern SCADA protocols: DNP3, IEC 60870.5 & related systems
Physics	1. Z Hartmut. Medical Physics Volume 1: Physical aspects of organs and imaging 2. Z Hartmut. Medical Physics V2: Radiology, Lasers, Nanoparticles & Prosthetics. 3. Riley, Hobson. Mathematical methods for Physics and Engineering (3 copies) 4. Squires R. Practical Physics (2 copies) 5. Boylestad. Electronic Devices and Circuits. Pearson. (3 copies)

Department	List of Outreach activities (Popular lectures)
Biotechnology	Ms. Anjelica Matias delivered a session on 'Role of Modern Biotechnology in Sustainability' on the 12th of March 2022 at Govt. HSS, Sanquelim
Microbiology	1. Awareness programs on "Diseases spread due to Floods" on 4th December 2021 and 22nd March 2022 conducted for school students 2. Hands-on training in Fermentation Technology conducted on 31st March 2022
Botany	Lecture and demonstration on "Mushroom Cultivation" at Sacred Heart of Jesus High School, Anjuna, Goa on 29th March 2022 by Mrs. Sabina Sales e Dias.
Electronics	An Online Talk on Recent developments in the field of Electronics" by the Collaborative Learning Café on 18th May, 2022 by Ms. Vilma Fernandes

Department	List of Invited Lectures
Biotechnology	1. International Webinar on 'Maintaining Optimal Oral Health Care' in association with the Department of Microbiology and Health Club on 19th March 2022.
Microbiology	1. Awareness Drive on "Sustainable Management of e-Waste and Plastic" by Mr. Sushant Figueiredo on 23rd October 2021 2. Career guidance session on "Study options for microbiology undergraduates" by Ms. Rochelle Pereira on 20th December 2021 3. Career guidance session on Funding options for life science graduates: study abroad scholarships by Dr. Roshan Naik on 21st December 2021

	4. Talk "Awareness of cervical cancer" by Dr. Deepti Pinto Rosario (07/02/2022)
Chemistry	1. Career Guidance Session on 'Ocean Biogeochemistry' on 12th March 2022 by Dr. Suhas S. Shetye, National Institute of Oceanography (NIO), Dona Paula. 2. Career Guidance Session on 11th April 2022 by Mr. Shashank Maldhar, Assistant Professor, Dhempe College of Arts & Science, Miramar, Goa. 3. Career Guidance Session on 23rd April 2022 by Mr. Vishal Thakare, Senior Quality Assurance Manager, Centaur Pharmaceuticals, Tuem, Pernem.
Computer Science	Future readiness for the IT Industry by Mr. Niteen Kole, Senior Solution Designer for Cooperators Group Limited, Canada (ADDENDA, CGIC, CGL, CLIC, CUMIS, FEDER, ATED, HB, SG) on 30/10/2021. (Webinar)
Mathematics	Summer school on "Linear Algebra - Diagonalization of Matrices"
Electronics	Workshop on Internet of Things – for training teachers of BCA Semester VI Course, Goa University, on 14th March 2022 by Ms. Vilma Fernandes

Course Coordinator
(With Seal)

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