Progress Report (FY 2020-2021)

DBT - Star College Scheme

for Strengthening of Science Education and Training at Undergraduate Level

Submitted to

DEPARTMENT OF BIOTECHNOLOGY

Ministry of Science & Technology

New Delhi – 110 003

Submitted by

VIRUDHUNAGAR HINDU NADARS' SENTHIKUMARA NADAR COLLEGE

(An Autonomous Institution Affiliated to Madurai Kamaraj University)

Virudhunagar - 626 001, Tamil Nadu

DEPARTMENT OF BIOTECHNOLOGY

Annual Progress Report supported under Star College Scheme

1. Name of the College : V.H.N. Senthikumara Nadar College (Autonomous), Virudhunagar

2. Name of Coordinator, Designation, Address, Phone nos.

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3. Assessment Duration 01/04/2020 to 31/03/2021

Duration in Years: 1 Year

4. Details of Departments Supported

Sl. No	Name of Department	Courses (B.Sc./M.Sc./PG Diploma, certificate etc) offered	Regular Faculty members Total = 74	
			With Ph.D.	Without Ph.D.
1.	Physics	B.Sc., M.Sc., MPhil and PhD	12	2
2.	Mathematics	B.Sc., M.Sc., MPhil and PhD	12	4
3.	Chemistry	B.Sc., M.Sc., MPhil and PhD	12	2
4.	Botany	B.Sc., M.Sc., MPhil and PhD	8	1
5.	Zoology	B.Sc., M.Sc., MPhil and PhD	10	2
6.	Microbiology	B.Sc. M.Sc., MPhil and PhD	4	1
7.	Computer Science	B.Sc.	4	---

5. Number & Date of Advisory committee meeting:

Requisition to conduct Advisory committee meeting has been sent to DBT. The internal Advisory committee meeting was held on 03-11-2020.

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

The DBT-Star college fund support has lead to the following qualitative improvements:

- Infrastructural development of the departments under support for the under graduate students
- Able to conduct and demonstrate of new practical experiments and more hands-on training for students to improve practical knowledge.
- Better understanding of theoretical concepts of students through hands-on experiences.
- Kindling research knowledge among students by taking up Mini projects
- Development of the students' skills to handle the instruments.
- The equipment's purchased under DBT star college scheme were effectively utilized by the students for their project work. Moreover, the chemicals and other consumables like Glass wares & minor electronic components were also much beneficial to the students for both project works and laboratory practical experiments. If the seven science departments were not granted with this Star College Scheme, the quality project works done by the undergraduate students of these departments would become a distant dream to them.
- Among the number of project works done by the students **Five prominent project** works carried out by Undergraduate students are listed below.

i. **Title of the project: Indirect Active Solar Dryer for Herbs**

Done by: M.Sri Nandha Guru, T.Kishore and M.Thangaprasath, III BSc (Physics)

It is a novel solar handmade air dryer constructed with thermal and humidity sensors. Indirect solar air dryer preserves the colour and medicinal values of herbs. In addition to that here in this project humidity and temperature sensors are used. It is a low cost and highly useful device for herbal medicinal industries.

ii. **Title of the project: Methylene blue dye removal from Aqueous solution by Biocarbon obtained from *Jatropha* Oil Cake**

Done by: R.Sangareshwari, I.Sangareswari, M.Sarigadharshini and S. Sasikala III BSc (Botany)

Discharge of dyes from textiles, cosmetics, printing, dying, food processing, and paper-making industries presents a major environmental problem for

developing countries because of their toxic and carcinogenic effects on living beings. Methylene blue dye removal from water by biocarbon obtained from Jatropha Oil Cake was successfully performed in this project.

iii. **Title of the project: IoT enabled Temperature Monitoring**

Done by: B.Akilesh and R.Sankaralingam, III BSc (Computer Science)

The Internet of Things (IoT) is enabling our hyperlinked world to get even more connected. IoT devices often have demanding requirements of high performance and low power microcontrollers which offer the highest level of integration with available peripherals and software stacks. Though the students who did this project have not studied these concepts in their curriculum, they have learnt through the hands of experience and by having discussion with the expert during their project.

iv. **Title of the project: Evaluation of antibacterial activity of citrus lemon fruit juice against Gram-positive and Gram-negative pathogens**

Done by: R.Iswarya, S.Ramkumar and R.Thenmozhi, III BSc (Zoology)

The aim of this study is to evaluate the antibacterial activity of lemon against different microbial isolates. The antimicrobial effects of aqueous extracts of lemon against Gram-positive and Gram-negative pathogens are evaluated.

v. **Title of the project: Smart Blind Stick using Arduino Uno and Ultrasonic Sensor**

Done by: R.Anitha, M.Gayathri III BSc (Physics)

The smart walking stick is a simple device to detect the obstacles on the ground. The ultrasonic sensor is used to detect the obstacles without touching it and the microcontroller processes the data and calculate the distance of the obstacle. This is a low-cost circuit which helps the visually challenged person to move freely without the help of others.

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

- In the ***Department of Mathematics*** the usage of software - LATEX was introduced in the curriculum for typing Mathematics projects and planning to introduce certificate courses on MATLAB.
- In the curriculum of BSc ***Computer Science*** three new courses were

introduced in the Laboratory for B.Sc final year students. They are ***Python Programming*** practical as a major course and ***Angular JS Programming*** practical as a Skill based course in the Fifth Semester and ***Node JS Programming*** practical as a Skill based course in the Sixth Semester.

- Two new experiments were introduced in Core Electronics Lab for ***BSc Physics*** students in the field of Solar Photovoltaic cells.
- A new course entitled ***Solar Thermal and Photovoltaic Systems*** was also introduced in the curriculum of ***BSc Physics*** programme.
- The course entitled ***Herbal technology*** is to be introduced for the ***BSc Botany*** students to acquire knowledge about medicinal plants and their herbal formulations. In addition to that students will be trained to identify the drugs by studying pharmacognostical features. In order to understand the pharmacognostical features of selected plant, Microtome has to be employed.
- The ***Department of Microbiology*** has introduced the following experiments into the curriculum for BSc students
  - Counting of bacterial cells using cell counter.
  - Estimation of lipids
  - Estimation of total solids (TS), total dissolved solids (TDS), total suspended solids in environmental water samples.
  - Separation of amino acids by column and ion exchange chromatography
  - Distillation of organic solvent using distillation unit.
  - Batch production of ethyl alcohol from sugarcane molasses.
  - Enzyme linked immunosorbent assay for detection of proteins in microbial samples.
  - RAPD analysis of isolated DNA from microbial samples using primers.
- New experiments to be included in ***BSc Chemistry*** curriculum with the support of DBT-Star college scheme are
  - Study of thermodynamic parameters of adsorption experiments for carcinogenic dyes for removal.
  - Physico-chemical analysis of water.
  - Food and oil analysis.
  - Estimation of metals in a three component mixture.
  - Synthesis of nanoparticles and biofunctionalization for genosensor /

enzymatic / immunosensor applications

- Organic / Inaorganic / DNA Molecular and bonding models. Solid state models
- Reaction mechanism molecular modelling / Drug designing and discovery
- Enzyme kinetics and their inhibition mechanisms
- Three component system (Phase rule) and applications
- Construction of Lead storage battery
- Soap, detergent, nail polish, mosquito repellent preparation
- Development of lab view based virtual instrumentation for sensor application.

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

Difficulties faced:

- Due to pandemic period, the students were available in the campus totally for 3 months during the academic year 2020 – 2021. So it was difficult to organize more workshops / conferences / Training programmes for the students
- The arrangement of field trips was very difficult as the permission for entry in to major industries and premier research institutes was denied citing social distancing norms.

Suggestions:

- As our college functioned only for 3 months with students and faculties in campus due to pandemic restrictions, the time was too short to utilize the entire recurring grant allocated for the academic year 2020-2021. As our college celebrating its Platinum Jubilee (75^{th} Year) along with Independence of India during this academic year (2021-2022) it is determined to carry out lot of curricular & co-curricular activities as part of the celebrations. In this regard the fund allotted under DBT Star College Scheme will be well utilized by the Seven science departments covered under the scheme by conducting more activities for the benefit of students. So the college may be permitted to carry over the unutilized Recurring and Contingency grants to be utilized in the next academic year (2021 – 2022), along with the Second year grant.

9. Key performance indicators

<table>
<tr><th>S. No</th><th>Indicator</th><th colspan="10">Pre-support</th><th colspan="10">During /After Support</th><th>Remarks</th></tr>
<tr><td rowspan="4">1</td><td rowspan="4">No. of students admitted</td><td colspan="10">Total =286</td><td colspan="10">Total =</td><td rowspan="4">Admission process yet to be completed</td></tr>
<tr><td colspan="5">M= 134</td><td colspan="5">F= 152</td><td colspan="5">M=</td><td colspan="5">F=</td></tr>
<tr><td>SC</td><td>ST</td><td>OBC</td><td colspan="2">G</td><td>SC</td><td>ST</td><td>OBC</td><td colspan="2">G</td><td>SC</td><td>ST</td><td>OBC</td><td colspan="2">G</td><td>SC</td><td>ST</td><td>OBC</td><td colspan="2">G</td></tr>
<tr><td>27</td><td>2</td><td>104</td><td colspan="2">1</td><td>31</td><td>1</td><td>120</td><td colspan="2">0</td><td></td><td></td><td></td><td colspan="2"></td><td></td><td></td><td></td><td colspan="2"></td></tr>
<tr><td>2</td><td>No. of students passing out (%) Students Admitted/passing out (pass %)</td><td colspan="10">Physics - 97.22%
Chemistry - 97.14 %
Mathematics - 100%
Zoology - 92.86%
Botany - 96.77%
Computer Science - 100%
Microbiology - 97.14%</td><td colspan="10">---</td><td>As the End semester examination results are yet to be published, the After support data will be furnished once results are published</td></tr>
<tr><td>3</td><td>Drop-out rates (Percentage of Drop-outs in the year 2020-2021)</td><td colspan="10">Physics - 6 %
Chemistry - 2 %
Mathematics - 4 %
Zoology - 1 %
Botany - Nil
Computer Science - 3 %
Microbiology - Nil</td><td colspan="10">---</td><td>---</td></tr>
<tr><td>4</td><td>No. of students opting for MSc</td><td colspan="10">Physics - 7
Chemistry - 7
Mathematics - 12
Zoology - 0
Botany - 4
Computer Science - 3
Microbiology - 17</td><td colspan="10">---</td><td>The After support data will be furnished once the Admission process for the next academic year
2021 – 2022 is completed</td></tr>
</table>

S. No	Indicator	Pre-support	During /After Support	Remarks
5	Average marks	Physics - 65 % Chemistry - 62 % Mathematics - 71 % Zoology - 63 % Botany - 63 % Computer Science - 72 % Microbiology - 65 %	---	---
6	No. of hands-on experiments being conducted	Zoology - 163 Botany - 78 Chemistry - 57 Computer Science - 212 Physics - 60 Micro biology - 67	Zoology - 166 Botany - 81 Chemistry - 69 Computer Science - 214 Physics - 62 Micro biology - 68	---
7	No. of new experiments introduced	Nil	Zoology - 4 Botany - 10 Chemistry - 12 Computer Science - 45 Physics - 2 Micro biology - 8	---
8	Publications (Scopus Indexed) /patents, if any.	**Publications: 25** Botany – 2 Chemistry – 10 Physics – 5 Zoology – 1 Mathematics – 7	**Publications: 40** Botany – 6 Chemistry – 23 Physics – 5 Zoology – 4 Computer Science – 2 **Patent: 1** Chemistry - 1	---
9	Training received by faculty	Botany – 3 Mathematics - 3 Physics – 2 Computer Science - 5	Zoology – 2 Mathematics - 65 Physics – 52 Micro Biology - 42	---

S. No	Indicator	Pre-support	During /After Support	Remarks
10	Exhibitions/seminars /training courses conducted	Botany –1 Chemistry – 2 Computer Science –1 Physics –2 Micro biology – 4 Mathematics -1	Zoology – 3 Botany – 1 Chemistry – 6 Computer Science – 4 Physics – 2 Micro biology – 5 Mathematics - 1	---
11	Books/journals subscribed from grants	**Books purchased :** Chemistry – 106 Zoology –55 Physics – 62 Botany – 46 Computer Science – 15 Mathematics – 45 Micro biology - 97	**Books purchased :** Chemistry – 27 Zoology - 3 **Journals subscribed:** Zoology – 3 Micro biology – 1	---
12	Outreach activities (Popular lectures)	---	Botany – 1 Mathematics – 1 Zoology – 1	---
13	Colleges mentored to apply for DBT Star College grants	---	Mentored **M.D.T. Hindu College, Trinelveli, Tamil Nadu** to apply for DBT Star college grants	---
14	Invited lectures	Physics – 6 Mathematics – 5 Botany – 2 Chemistry – 8 Micro Biology – 5 Computer Science – 10	Physics – 7 Mathematics – 3 Botany – 2 Zoology – 1 Chemistry – 2 Micro Biology – 1	---

10. Self-evaluation

Department	*Objective (as stated in proposal)	% achieved	Reasons for underachievement / If achieved, state in quantitative metrics
Mathematics	• Purchase of proposed equipments • To conduct Guest Lectures, Seminars, conferences • To Prepare Mathematical Models and Charts to expose the techniques involved • To offer Mini-Projects to the UG students	80% 50% 60% 100%	Due to pandemic situation and as college was open for only 3 months in this academic year (2020-2021), the rest of the activities could not be achieved
Zoology	• To conduct practical experiments involving handling of microscopes • To offer Project works to the UG students • Purchase of proposed equipments • To enhance the diagnostic skills of students, the curriculum will be designed in such a way that the common infectious diseases can be discerned from patient's serum samples • The students will be encouraged to attend summer training programmes	50% 100% 100% 0% 0%	
Computer Science	• Introducing new Courses • Workshop for students • Purchase of proposed equipments • Outreach activity for Staff Members • Outreach for other school teachers	100% 100% 100% 50% 0%	
Chemistry	• Bench skills of students, project work, summer training & industrial training • Measures to be undertaken to upgrade skills of faculty by participation in faculty improvement programme	45% 40%	

Department	*Objective (as stated in proposal)	% achieved	Reasons for underachievement / If achieved, state in quantitative metrics
	• Appropriate modifications proposed in curriculum to cover laboratory exposure to students and IPR & bio-safety issues	0%	Due to pandemic situation and as college was open for only 3 months in this academic year (2020-2021), the rest of the activities could not be achieved
	• Involving visiting faculties	43%	
	• Purchase of proposed equipments	100%	
Physics	• Seminars / training courses conducted	50%	
	• Invited lectures	100%	
	• Field trips	100%	
	• Projects for UG Physics students	100%	
	• Purchase of proposed equipments	85%	
Micro biology	• Industrial visit	100%	
	• Seminars regarding Modern techniques in microbiology	100%	
	• Purchase of proposed equipments	100%	
	• Conducting science exhibitions to school students	0%	
	• Visiting Lectures by Alumni of the department	100%	
Botany	• Purchase of proposed equipments	100%	
	• Industrial visit	100%	
	• Entrepreneur development program	100%	
	• Seminars / training courses conducted	50%	
	• Projects for UG Botany students	100%	

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

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Proofs for S.No. 6-14 of Key performance indicators

6. Number of hands-on experiments being conducted (Newly introduced)

Department of Zoology

1. Isolation of genomic DNA from goat liver, **2.** Separation of DNA from biological samples by electrophoresis and **3.** Quantification of DNA and RNA are conducted to III B.Sc. Zoology students

Department of Botany

1. Hands on training on Spirulina cultivation, **2.** Demonstration and hands on training on Working of Muffle furnace and **3.**Demonstration and hands on training on working of Digital Microtome

Department of Chemistry

1. To study the thermodynamic parameters of adsorption experiments for carcinogenic dyes for removal, **2.**Physico-chemical analysis of water, **3.**Food and oil analysis, **4.**Estimation of metals in a three component mixture, **5.**Synthesis of nanoparticles and biofunctionalization for genosensor / enzymatic / immunosensor applications, **6.**Organic / Inaorganic / DNA Molecular and bonding models, **7.**Reaction mechanism molecular modeling, **8.**Enzyme kinetics and their inhibition mechanisms, **9.**Three component system (Phase rule) and applications, **10.** Construction of Lead storage battery, **11.** Soap, detergent, nail polish, mosquito repellent preparation **and 12.**Development of labview based virtual instrumentation for sensor application

Department of Computer Science

1. Python Programming **and 2.** Angular JS and Node JS Programming

Department of Physics

1. Hands on training on study of I-V characteristics of Solar Photovoltaic Module with varying radiations **and 2.**Hands on training on study of I-V characteristics of Solar Photovoltaic Panels in (i) Series Connection and (ii) Parallel Connection.

Department of Micro biology

1. Hands on Training on Mushroom Cultivation

7. Number of New experiments introduced

Department of Zoology

1. Precipitation – Radial immune diffusion test, **2.**Estimation of DNA by diphenylamine method, **3.**Estimation of RNA by orcinol method and **4.** Determination of hardness and alkalinity of reeling water by titration method

Department of Botany

1. Identification of sugar from herbal plant extracts, **2.** Preparation of herbal plant extracts & their standardization by analytical profiles, **3.**Quality Control tests for raw materials used in Herbal preparation, **4.** Determination of ash values of drugs, **5.**Study of stomatal frequency and index, **6.**Organoleptic properties of crude drugs, **7.**Florescent analysis of selected Herbal samples, **8.**Estimation of pesticide residues in herbal products, **9.**Preparation of selected cosmetic preparations representing the following classes **and 10.**Pharmacognostical standardization of various Herbal plant stem

Department of Chemistry

1.To study the thermodynamic parameters of adsorption experiments for carcinogenic dyes for removal, **2.**Physico-chemical analysis of water, **3.**Food and oil analysis, **4.**Estimation of metals in a three component mixture, **5.**Synthesis of nanoparticles and biofunctionalization for genosensor / enzymatic / immunosensor applications, **6.**Organic / Inaorganic / DNA Molecular and bonding models, **7.**Reaction mechanism molecular modeling, **8.**Enzyme kinetics and their inhibition mechanisms, **9.**Three component system (Phase rule) and applications, **10.** Construction of Lead storage battery, **11.** Soap, detergent, nail polish, mosquito repellent preparation **and 12.**Development of labview based virtual instrumentation for sensor application

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Department of Computer Science

45 New software programming experiments were introduced in the curriculum of BSc Computer Science students

Department of Physics

1. Study of I-V characteristics of Solar Photovoltaic Module with varying radiations and **2.**Study of I-V characteristics of Solar Photovoltaic Panels in (i) Series Connection and (ii) Parallel Connection.

Department of Micro biology

1. Counting of bacterial cells using cell counter. **2.**Estimation of lipids **3.** Estimation of total solids (TS), total dissolved solids (TDS), total suspended solids in environmental water samples. **4.**Separation of amino acids by column and ion exchange chromatography **5.**Distillation of organic solvent using distillation unit **6.**Batch production of ethyl alcohol from sugarcane molasses **7.** Enzyme linked immunosorbent assay for detection of proteins in microbial samples and **8.** RAPD analysis of isolated DNA from microbial samples using primers

8. Publications (Scopus indexed) /patents, if any.

- **Patent filed:**
  Neurodegenerative disease biomarker proteins specific synthetic receptor based functional molecular imprinted polymers (Application No: 202141013005dt. 25/03/2021), Patent No: 10986 **Filed by:** Dr.C.Karunakaran. Head & Associate Professor of Chemistry
- **List of Publications:**

Department of Botany

1.	Uma Subbulakshmi S and Nirmalkumar N, Nano material and ecosystem: potential effect and involved process, **PalArch's Journal of Archaeology of Egypt/Eqyptology**, 17(6), 2020, 13392-13400.
2.	Hariram M, Ganesan V, Muthuramkumar S, and Vivekanandhan S. Functionalization of kaolin clay with silver nanoparticles by Murrayakoenigii fruit extract-mediated bioreduction process for antimicrobial applications, **Journal of the Australian Ceramic Society**, 57, 2021, 505-513.
3.	Osuri A.M, Machado S, Ratnam J., Sankaran M., Ayyappan N, Muthuramkumar S, Parthasarathy N, Pélissier R, Ramesh BR, DeFries R, and Naeem, S, Tree diversity and carbon storage cobenefits in tropical human-dominated landscapes, **Conservation Letters**, 13(2), 2020, 12699.
4.	Ganesan, V., Hariram, M., Vivekanandhan, S. and Muthuramkumar, S. (2020). Periconium sp. (endophytic fungi) extract mediated sol-gel synthesis of ZnO nanoparticles for antimicrobial and antioxidant applications **Materials Science in Semiconductor Processing**105, 2020, 104739.
5.	Gnanasangeetha D, and Suresh M, A Review on Green Synthesis of Metal and Metal Oxide Nanoparticles, **Nature Environment and Pollution Technology**, An International Quarterly Scientific Journal, 19(5) 2020, 1789-1800.
6.	M. Thilagam, B. Esakkiammal and P. Mehalingam, Phytomediated Synthesis and Characterization of Silver Nanoparticles from the Leaf Extracts of *Begonia Malabarica* Lam and its Antimicrobial Activity, **Annals of the Romanian Society for Cell Biology**, 25 (2), 2021, 3640-3649.

Department of Chemistry

1.	C. Karunakaran, M. Karthikeyan, M. Dhinesh Kumar, G. Kaniraja and K. Bhargava, Electrochemical biosensors for point-of-care applications, **Defence Science Journal,** 70 2020, 549-556.
2.	A. Arunadevi and N.Raman, Indole derived water soluble N, O bi-dentate ligand based mononuclear transition metal complexes: In silico and in vitro biological screening, molecular docking and macromolecule interaction studies, **J.Biomol.Struct.Dyn**, 38, 2020, 1499-1513.
3.	K.Palpandi and N.Raman, Electrochemical detection of 2-nitroaniline at novel sphere-like Co_2SnO_4 modified glassy carbon electrode **New J.Chem**., 44, 2020, 8454 -8462.
4.	A.Arunadevi and N. Raman, Biological response of Schiff base metal complexes incorporating amino acids – a short review, **J.Coord.Chem**.,73, 2020, 2095-2116.
5.	PorkodiJeyaraman, M. Samuel, Antonysamy Johnson and N.Raman, Synthesis, characterization, ADMET, in vitro and in vivo studies of mixed ligand metal complexes from a curcumin Schiff base and lawsone, **NucleosNucleotNucl.**,40(3), 2021, 242-263.

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6.	hivel, B.Thangagiri, N.Raman, J.Joseph, RamuGuda, MamathaKasula and L.Mitu, Spectroscopic, SOD, anticancer, antimicrobial, molecular docking and DNA binding properties of bioactive VO(IV), Cu(II), Zn(II), Co(II), Mn(II) and Ni(II) complexes obtained from 3-(2-hydroxy-3-methoxybenzylidene)pentane-2,4-dione, **J.Biomol.Struct.Dyn**., 2020.
7.	andrasekar, A. Arunadevi and N.Raman, Synthesis, spectral characterization, DNA binding and antimicrobial profile of biological active mixed ligand Schiff base metal(II) complexes incorporating 1,8-diaminonaphthalene, **J.Coord.Chem,** 74, 2021, 804-822.
8.	MuruganKumaresan, Tata Sanjay kannasharma, Kuo Yuan Hwa, VadivelSaravanan, Ponnusamy Sami and MeenakshisundaramSwaminathan, Natural clay loaded Sm_2MoO_6nanocomposite, a green catalyst, for multiple applications, **Nano-Structures & Nano-Objects**, 26(1), 2021, 100744.
9.	MuruganKumaresan, VadivelSaravanan and Ponnusamy Sami, MeenakshisundaramSwaminathan, A green solid acid catalyst 12-tungstophosphoric acid $H_3[PW_{12}O_{40}]$ supported on g-C_3N_4 for synthesis of quinoxalines, **Research on Chemical Intermediates**, 46, 2020, 4193-4209.
10.	KaruppaiahSelvakumar, MuruganKumaresan, Ponnusamy Sami and MeenakshisundaramSwaminathan, Eco-friendly heteropoly acid supported on natural clay for the synthesis of calix[4]resorcinarene derivatives, **Indian Journal of Chemical Technology**, 27, 2020, 185-191.
11.	M. Murugalakshmi, B. Filip Jones, G. Mamba, D. Maruthamanid and V. Muthuraj, Unravelling the visible light-assisted catalytic prowess of an n–n type In_2S_3/CeO_2 Z scheme heterojunction towards organic and inorganic water pollution mitigation. **New J. Chem.,** 45, 2021, 4046-4060.
12.	KadarkaraiGovindan, Sung-JuIm, VelluchamyMuthura and Am Jang, Electrochemical recovery of H_2 and nutrients (N, P) from synthetic source separate urine water. **Chemosphere,** 269, 2021, 129361.
13.	Laskhmi Prabavathi, Saravanakumar, Chang Min Park and Velluchamy Muthuraj, Photocatalytic degradation of levofloxacin by a novel Sm6WO12/g-C3N4 heterojunction: Performance, mechanism and degradation pathways, **Separation and Purification Technology,** 257, 2021, 117985.
14.	Saravanakumara, Balakumarc, Kadarkarai Govindand, Am Jangd, Giehyeon Leeb and Velluchamy Muthuraj, Polyaniline intercalated with Ag1.2V_3O_8nanorods based electrochemical sensor. **Journal of Industrial and Engineering Chemistry,** 91, 2020, 93–101.
15.	Abinaya and Velluchamy Muthuraj, Bi-functional catalytic performance of silver manganite/polypyrrolenanocomposite for electrocatalytic sensing and photocatalytic degradation. **Colloids and Surfaces A,** 604, 2020, 125321.
16.	M. Umadevi ,V. Muthuraj and R. Vanajothi, Structural, cytotoxicity and molecular docking studies of some quinolineschiff bases and their Pd(II), Mn(II) and Ru(II) complexes. **J. Molecular Structure,** 1221, 2020, 128778.
17.	FilipJonesa, Maruthamani and VelluchamyMuthuraj, Construction of novel n-type semiconductor anchor on 2D honey comb like FeNbO4/RGO for visible light drive photocatalytic degradation of Norfloxacin. **J. Photochemistry & Photobiology A: Chemistry,** 400, 2020, 112712.
18.	M. Murugalakshmi, G. Mamba and V. Muthuraj, A novel In2S3/Gd2O3 p-n type visible light-driven heterojunctionphotocatalyst for dual role of Cr(VI) reduction and oxytetracycline degradation, **Applied Surface Science,** 527, 2020, 146890.
19.	S. Lakshmi Prabavathi, K. Saravanakumar, T. T. I. Nkambule, V. Muthurajand·G. Mamba, Enhanced photoactivity of cerium tungstate-modified graphiticcarbon nitride heterojunctionphotocatalyst for the photodegradation of moxifloxacin, **J. Materials Science: Materials in Electronics**, 31, 2020, 11434–11447.
20.	Abinaya, KadarkaraiGovindan,, Kalpana, Saravanakumar, LaskhmiPrabavathi, VelluchamyMuthuraj and Am Jang, Reduction of hexavalent chromium and degradation of tetracycline using a novel indium-doped Mn_2O_3nanorodphotocatalyst, **J. Hazardous Materials,** 397, 2020, 122885.
21.	M. Dhanalakshmia, S. Lakshmi Prabavathi, K. Saravanakumar, B. Filip Jones and V. Muthuraj, Iridium nanoparticles anchored WO3 nanocubes as an efficient photocatalyst for removal of refractory contaminants (crystal violet and methylene blue). **Chemical Physics Letters,** 745, 2020, 137285.
22.	KasirajanPrakash and SwaminathanKaruthapandian, Construction of Novel Metal-Free Graphene Oxide/Graphitic Carbon Nitride Nanohybrids: A 2D–2D Amalgamation for the Effective Dedyeing of Waste Water, **Journal of Inorganic and Organometallic Polymers and Materials**, 31, 2021, 716–730.
23.	M. Gayathria, P. Senthil Kumar, M. Santhameenakshia and S. Karuthapandian, Metal-free and stable dye-sensitized polymer matrix for the detoxification of antibiotic drug levofloxacin under visible light illumination., **Separation Science And Technology**, 56(8), 2021, 1466-1474.

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Department of Physics

1.	A.MathiVathani, S.Dhanalakshmi, N.Jeyakumaran, and N. Prithivikumaran, "Fabrication of Al–TiO_2 Thin Film Electrode by Spray Pyrolysis Technique for Urea Sensing" , **Journal of Nanoscience and Nanotechnology**, 20(5), 2020, 2887-2892.
2.	I.Rathinamala, I.ManoharaBabu, J. Johnson William, G. Muralidharan and N. Prithivikumaran, CdS microspheres as promising electrode materials for high performance supercapacitors, **Materials Science in Semiconductor Processing**, 105(104677), 2020, 1-8.
3.	Christoff Reimer, Michael R. Snowdon, Singaravelu Vivekanandhan, Xiangyou You, ManjusriMisra, Stefano Gregori, Deborah F. Mielewski and Amar K. Mohanty, Synthesis and characterization of novel nitrogen doped biocarbons from distillers dried grains with solubles (DDGS) for supercapacitor applications, **Bioresource Technology Reports**, 9, 2020, 100375.
4.	M Siva Sankari and S Vivekanandhan, Jatropha Oil Cake Based Activated Carbon for Symmetric Supercapacitor Application: A Comparative Study on Conventional and Hydrothermal Carbonization Processes, **Chemistry Select**, 5(4), 2020, 1375-1384.
5.	I.Rathinamala, I.Manohara Babu, J. Johnson William, G. Muralidharan and N. Prithivikumaran, Extra-Durable Hybrid Supercapacitor Based on Cobalt Sulfide and Carbon (MWCNT) Matrix Electrodes, **Journal of Energy Storage**, 34(102200), 2021, 1-11.

Department of Zoology

1.	Abirami S, Edwin Raj B Soundarya T. Kannan M, SugapriyaDhanasekaran, Noura Al-Dayan and Arif Ahmed Mohammed, Exploring Antifungal Activities of Acetone extract of Selected Indian Medicinal Plants against Human Dermal Fungal Pathogens, **Saudi Journal of Biological Sciences**, 28(4), 2021, 2180-2187.
2.	M. Subbulakshmi, SugapriyaDhanasekaran, S. Abirami, R. Palaniappan, M. Kannan and DivyaVenugopal, Phylogenetic Analysis and Protective Effects of Thymol and its Chromatographic Fractions from a Novel Wild Mushroom in Combating Oxidative Stress. **Food Science and Human Wellness,** 10(4), 2021, 452-459.
3.	KannanMarikani, AbiramiSasi, VenkatesanSrinivasan, SugapriyaDhanasekaran, Noura-Al Dayan and DivyaVenugopal, A Synergism of Eco-Friendly Dyeing of Cotton Fabric and Therapeutic benefits of Seed Extract, **International Journal of Life Science and Pharma Research**, 10(5), 2020, 207-214.
4.	R.Sivasankari and .T.DuraiAnand, ECG Analysis and Cardiac Disease identification using Discrete Wavelet based ANN and ANFIS, **Advanced Science Letters**, 26(6), 2020, 141-146.

Department of Computer Science

1.	K. S. Jeyalakshmi and T. Kathirvalavakumar,Haralick Features from Wavelet Domainin Recognizing Fingerprints Using NeuralNetwork, **Springer Nature**, 2020, 120–130
2.	T. Kathirvalavakumar, S. Karthikeyan and RajendraPrasath, Under-Sample Binary Data Using CUREfor Classification, **Springer Nature**, 2020, 186–195

9. Training received by faculty

Sl.No	Faculty Name & Department	Training Program attended
1.	Mr. G. Rameshkumar, Assistant Professor of Zoology	Hands-on training Programme – 1
2.	Dr. D. Kumar, Assistant Professor of Zoology	Hands-on training Programme – 1
3.	Dr.C.Ganesan, Assistant Professor of Mathematics	Online training program – 1 Faculty Development programme – 3 Webinar - 3
4.	Mrs.G.Petchiammal, Assistant Professor of Mathematics	International Virtual Conference – 1 Online training program – 3 Workshop – 3 & Webinar –4

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5.	Dr.A.Rizwana, Assistant Professor of Mathematics	Virtual Conference – 1 Faculty Development programme – 10 Online training program – 9 Workshop – 2 & Webinar –14
6.	Dr,P.Mahalakshmi Assistant Professor of Mathematics	Faculty Development programme – 7 Workshop – 2 & Webinar –2
7.	Dr. S. Prakash, Assistant Professor of Physics	Webinar – 11 & Short Term Course – 1
8.	Mrs. A Alagulakshmi, Assistant Professor of Physics	Orientation Programme – 1 Faculty Development Programme – 6 Short Term Course – 2 & Webinar – 3
9.	Mrs. S Saravana Selvi, Assistant Professor of Physics	Faculty Development Programme – 1 Short Term Course – 2 & Webinar – 6
10.	Dr. A. MathiVathani, Assistant Professor of Physics	Faculty Development Programme – 7 Short Term Course – 2 & Webinar – 12
11.	Dr. A. Balasubramanian, Head & Assistant Professor of Microbiology	Webinar – 2 & Virtual Conference – 1
12.	Dr. T. Shanmugaprabha, Assistant Professor of Microbiology	Faculty Development programme – 1 Online training program – 2 & Webinar –1
13.	Mrs. A. R. Vijaya Lalitha Assistant Professor of Microbiology	Faculty Development programme – 5 Virtual Conference – 2 & Webinar –2 International Colloquium – 1
14.	Dr. V. Siva, Assistant Professor of Microbiology	Faculty Development programme – 3 International Conference – 1 National Seminar – 1 & Webinar –1
15.	Mr. S. Palpperumal Assistant Professor of Microbiology	Faculty Development programme – 7 Webinar – 8
16.	Dr. B. Harinathan Assistant Professor of Microbiology	Webinar – 4

10. Exhibitions/seminars/training courses conducted

Sl.No	Department	Programsconducted
1.	Zoology	1. Hand on Training on Mushroom Cultivation 2. Webinar Programme on Advanced PCR Techniques 3. One day Training Programme on Ornamental Fish culture Techniques
2.	Botany	1. Hands on Training on Spirulina Cultivation
3.	Chemistry	1. Webinar on Recent Evolution in Bio-Inorganic Chemistry 2. Workshop on Chemical Research Methodology 3. Seminar on Women empowerment in Higher Education 4. Workshop on Molecular Modeling/ Drug Designing and Discovery 5. Workshop on Development of Electro Chemical Biosensors 6. Workshop on Labview Based Virtual Instrumentation for Sensor Application
4.	Computer Science	1. Workshop on Angular JS-Hands on Training through Online 2. Seminar on Cloud computing and Micro services 3. Workshop on Content Management system 4. Faculty development programme on Editing Tools for E-Content Development
5.	Physics	1. One day Training Programme on Laboratory Safety and first Aid for Science Laboratory Technicians 2. Hands on Training Programme on Photography and Photoshop
6.	Micro biology	1. Faculty Development programme on How to face the Pandemic situation: Pedagogic and personal effectiveness 2. Webinar on Application of Image Processing in Emerging & Re- emerging microscopic images 3. Workshop on Mushroom Cultivation Technology

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		4. Training on Mushroom Cultivation 5. National Seminar on Role on Biotechnology in Conservation of Plant Genetic Resources
7.	Mathematics	1. Open National Level Online Quiz on "Abstract Algebra"

11. Books/journals subscribed fromgrants

Department	Books/journals subscribed
Zoology	1. Concise Book of Medical Laboratory Technology Methods and Interpretations, (2015). 2nd Edition, RamnikSood, JAYPEE Brothers Medical Publishers 2. Manual of Laboratory Safety (Chemical, Radioactive, and Biosafety with Biocides), (2013), 1st Edition, Najat Rashid and RamnikSood, JAYPEE Brothers Medical Publishers 3. A Text Book of Fish Biology & Fisheries, (2014), 3rd Edition, S SKhanna and H R Singh, Narendra Publishing House
Microbiology	1. Indian Journal of Experimental biology

12. Outreach activities

Department	Activities
Botany	Institutional visit and Training Programme given to students of Theni Arts and Science College, Theni, Tamilnadu
Mathematics	Open National Level Online Quiz on "Abstract Algebra" during 19/6/2020 to 21/6/2020
Zoology	An Online Quiz was conducted to Students and Public to commemorate the birth anniversary of Charles Darwin on 12th February 2021

14. Invited Lectures

Department	Invited lectures
Physics	1. Lecture on Astrophysics and Space Science – Lecture 1 2. Lecture on Astrophysics and Space Science – Lecture2 3. Lecture on Magnetic Materials – Lecture1 4. Lecture on Magnetic Materials – Lecture2 5. Lecture on Applied Physics – Lecture1 6. Lecture on Applied Physics – Lecture2 7. Lecture on Physics for Tomorrow's Technology
Mathematics	1. Lecture on Happy Numbers 2. Lecture on Career Paths and Applications of Mathematics 3. Lecture on Life with Numbers
Botany	1. Lecture on Role of Biotechnology in conservation of plant Genetic resources 2. Lecture on Healthy food for wealthy mood
Zoology	1. Lecture on Bioactive Potentials of Seaweed Polysaccharides
Chemistry	1. Lecture on Inorganic Materials for Environment and Biosensing 2. Lecture on Hydrotalcite Based Materials for Hydrogenation and Hydroformylation
Micro Biology	1. Lecture on Mushroom Cultivation and Trade

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