Report for Utilization of DST-PURSE Grant

F. Y. 2013-14 (1st April 2013 to 31st March 2014)

1. Name of University:

Sardar Patel University,

Vallabh Vidyanagar-388120,

Gujarat

2. Address for Communication:

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3. Date and Ref. No. of DST Sanction Letter: SR/S9/Z-23/2010/43 dated 16th March 2011

4. Total Amount Released under the Programme

Sanctioned: Rs. 600.00 Lakhs

Released: Rs. 400.00 Lakhs

5. Expenditure during the period 1st April 2013 to 31st March 2014:

Rs. 2,69,73,318.00

Total expenditure consolidated upto 31st March 2014:

Rs. 4,44,37,420.00

6. Details of the Grant

Sr. No.	(A) Flexible Component	Amount (Rs. In Lakhs) Received with Date
1.	Equipment	270.00
2.	Consumable	25.00
3.	Research Infrastructure Facility	25.00
4.	Networking & Computational Facility	15.00
	Total (A)	**335.00**
Sr. No.	**(B) Fixed Component**	
1.	Manpower	45.00
2.	Contingencies	4.00
3.	Travel	4.00
4.	Seminar/ Workshop	4.00
5.	Maintenance	8.00
	Total (B)	**65.00**
	Total (A+B)	**400.00 (31/03/2014)**

7. Details of Utilization of PURSE Grant under the Flexible Component:

7a. Sanctioned Major Equipment Ordered/ Purchased/ Installed:

i) Instruments Purchased and Installed

Sr. No.	Name (With Model & Make)	Order Date	Installation Date	Cost in INR (Total Cost of the Equipment after paying all the charges)
1.	Inverted Fluorescence Phase contrast Research Microscope Make: Carl-Zeiss, Germany + Custom Duty of Inverted Fluorescence Microscope	06-10-2012	18-04-2013	18,63,493.00 + 99,265.00 = 19,62,758/-
2.	Spectroflurophotometer Model: RF-5301PC, Make: Shimadzu, Japan	30-06-2012	12-04-2013	8,17,703.00
3.	Research Rotary and Oscillatory Rheometer Model 102 Modular Compact Make: Anton Paar, Graz. Austria	29-11-2012	25-05-2013	17,40,714.00
4.	Single Stage Oil Free air Compressor 0.5 HP	13-06-2013	25-05-2013	40,660.00
5.	Cold Storage Freezer (-80) 300 Ltr, Model: U410 Make: Eppendorf	30-12-2013	19-3-2014	4,40,000.00
6.	High Performance Particle Size Analyzer along with Zeta Potential Model: SZ100 Make: Horiba Ltd., Japan	19-12-2013	17-04-2014	17,34,500.00
7.	Fluorescence Micro Plate Reader Model No. Spectramax MZ & Multi Detection) Model: Spetramax MZc & Multi Detection Make: Molecular Devices LIC, U. S. A	03-12-2013	26-03-2014	15,33,700.00
8.	Complete DCI-VC-V Semiconductor Characterization System Make: Tektronik Asia Ltd., Beaverton	28-02-2014	23-04-2014	40,14,230.00
9.	Isothermal Titration Calorimeter (Nano ITC Standard Volume System) Make: Water Ges.m.b.H, Vienna, Austria	21-02-2014	09-05-2014	45,50,385.00
			Total Rs.	**1,68,34,650.00**

ii) Instruments Purchased and under installation:

Sr. No.	Name (With Model & Make)	Order Date	Cost in INR (Total Cost of the Equipment after paying all the charges)
1.	Size Exclusion Chromatograph for Static Light Scattering Unit	02-12-2013	**15,14,505.00**

iii) Instruments with Procurement in Progress

Sr. No.	Name (With Model & Make)	Order Date	Cost in INR (Total Cost of the Equipment after paying all the charges)
1.	Refrigerated Centrifuge (Table Top Model)	23-01-2014	**4,51,370.00**

iii) Other Expenditures:

Sr. No.	Name (With Model & Make)	Order Date	Installation Date	Cost in INR (Total Cost of the Equipment after paying all the charges)
1.	HP Desktop Computer D4, HP Desk Jet advantage Printer	29-04-2013		41,310.00
2.	UPS APC SUA 1000UXI Smart, Battery SMF UPS 12V/26Ah & Rack Battery (No.3) (for Spectroflurophotometer, Inverted Fluorescence Phase contrast Research Microscope & Research Rotary and Oscillatory Rheometer Model 102 Modular Compact instruments)	24-04-2013	16-05-2013	48,600.00
3.	Advertisement for Scientific Equipment	-	-	8,232.00
4.	Advertisement for Scientific Equipment	-	-	46,131.00
5.	Manual Pipette Filter (Himedia)	03-01-2014	-	8,231.00
6.	Vertical Autoclave, MEDICA make Equitron Constant Temp. Bath & ALMICRO Research Inclined Binocular Microscope (for cell culture lab)	09-01-2014	-	1,43,924.00
7.	REMI make Cyclomixer for (cell culture lab)	03-01-2014	-	6,321.00
8.	Advertisement for Scientific Equipment	-	-	13,549.00
9.	SYSTRONICS make Micro Processor Based pH Meter Electrode and Temp. Probe Model-362	03-01-2014	-	21,456.00
10.	Advertisement for Scientific Equipment	-	-	7,056.00
11.	Liquid Nitrogen Container 3.9 & 10.5 (for Research Lab)	03-02-2014	-	36,734.00
12.	Cylinder Regulator CO_2, Cylinder N_2, Cylinder Regulator Ar, CO_2 Hitter	22-01-2014	-	39,485.00
13.	Digital Micro Pipettes	09-01-2014	-	62,500.00
14.	High Pressure Seamless Steel Gas Cylinder for N_2, Ar & CO_2 Gas Cylinder	22-01-2014	-	54,780.00
			Total Rs.	**5,38,309.00**

7b. Particulars for Consumables Procured (Chemicals, Supplies etc.)

"For research worker in CENTER FOR INTERDISCIPLINARY STUDIES IN SCIENCE AND TECHNOLOGY (CISST) expenditure Total Rs. 7, 53,125/-"

Please see below for Complete Details:
Details:

Sr. No.	Name of the Chemical/Consumable	Quantity	Make/Grade
1.	Volumetric Flasks	6*20ml	Borosil
		6*100ml	
		6*250ml	
		6*500ml	
		6*1000ml	
2.	Measuring Cylinders	6*5ml	Borosil
		6*10ml	
		6*25ml	
		6*50ml	
		6*100ml	
3.	Pipettes	6*1ml	Borosil
		6*5ml	
		6*10ml	
		6*25ml	
4.	Beakers with Spout	6*50ml	Borosil
		6*100ml	
		6*250ml	
		6*500ml	
		6*1000ml	
5.	Reagent Bottles with screw caps & pouring	6*100ml	Borosil
		6*250ml	
		6*500ml	
		6*1000ml	
6.	Conical Flasks	6*100ml	Borosil
		6*150ml	
		6*250ml	
7.	Wash Bottles	6*500ml	Borosil
8.	Burettes	6*500ml	Borosil
9.	Funnels	6*50mm	Borosil
		6*75mm	
10.	Glass Rods	6*7 x 305mm	Borosil
		6*7 x 255mm	Borosil
11.	Spatula-one side flat other side spoon	10*150mm	Sun
		10*250mm	
12.	Foreceps-pin point	5*150mm	Sun
13.	Serrated Corrugated Handles	6*150mm	Sun
14.	Hand Gloves	2*300mm	Sun
		2*300mm	
15.	Rubber Bulbs	5*1-5ml	Sun
		5*10ml	
		5*25ml	
16.	Filter Paper	1 pkt*46 x 57cm	Sun
17.	Blotting Papers	100*45 x 55cm	Sun
18.	Lens Cleaning Tissues (300 Sheets)	3pkt* 145 x 90mm	Sun

19.	Tissues Paper Roll	25*50 x 2plyRoll	Sun
20.	Butter Paper	10*760x510cm	Sun
20.	Pipettes Brush	15 Nos.	Sun
21.	Burette Brush	15 Nos.	Sun
22.	Absorbent Cotton Roll	05 Nos.	Sun
23.	Aluminium Foils	10 Nos.	Sun
24.	Thermo Hygrometer – Digital	01 Nos.	Sun
25.	T.T. Stand (PP)	02*20mm 20Hole	Vijay
26.	Beaker Plastic	6*250ml	Vijay
		6*500ml	
27.	Watch Glasses	25*5cm	Vijay
		25*7.5cm	
28.	Mortar and Pestle	1*150mm	Vijay
29.	Evaporating Dish	3*110mm	Vijay
30.	Capillary tube both side open	2 Nos.	Vijay
31.	Burette Stand Heavy	5* 9''x6"	Vijay
32.	Burette Stand	5* 8"x5"	Vijay
33.	Dissecting Tray with Wax	1* 12"x10"	Vijay
		2*12"x15"	
34.	T.T. Stand	12*25&16mm	Vijay
35.	Micropipette (Eppendorf)	1*1-2.5µl	Merck
		1*2-20µl	
		1*10-100µl	
		1*20-200 µl	
36.	Tips	1*0.1-10 µl	Merck
		1*2-200 µl	
37.	pH strip	10*1 to 14	Merck
38.	Azobisisobutyronitrile or AIBN	1 Nos.	Spectrochem
39.	Buchner Funnels	5*50mm	Sun
		5*75mm	
		5*100mm	
40.	Burette Clamp Cross Pattern	10 Nos.	Sun
41.	Burette Stand	5*12x750	Sun
42.	Condenser and Flask Clamp Regular	12 Nos.	Sun
43.	Condenser and Flask Clamp Medium	10 Nos.	Sun
44.	Condenser and Flask Clamp Large	8 Nos.	Sun
45.	Cotton Rolls Absorbent	6 Nos.	Sun
46.	Forceps Pin Point	5*150mm	Sun
47.	Magnetic Needles	12*9 x 6	Sun
		12*12 x 8	
		12*22 x 10	
48.	Mercury Seals	3*B/19	Sun
		3*B/24	
49.	Rubber Bulbs	6*1-5ml	Sun
		6*10ml	
		6*25ml	
50.	Rubber Corks	20*26.5/21	Sun
		20*26.0/21.5	
		20*19/14	
		20*22.5/17	
51.	Rubber Tube for Condenser	1*8.0mm	Sun
52.	Separating Funnel Standard Joint	3*500mm B/24	Sun
		3*1000mm B/24	
53.	Spatula One Side Flat Other side spoon	5*125mm	Sun

		5*100mm	Sun
54.	Digital Thermo Hygrometer with clock	3 Nos.	Sun
55.	Tissue Paper Roll	50 Nos.	Sun
56.	Universal Boss Head	12 Nos.	Sun
57.	Diposable Syringes with Needles	100*1ml	Sun
		100*2ml	
58.	Spatula- Micro S. S.	6*125mm	Sun
59.	Melting Point Capillary	3*3"	Sun
60.	Thermometers Range	6*-10 to 110c	Sun
		6*-10 to 360c	
61.	Nitrile Hand Gloves Medium Size	1 Pkt.	Sun
62.	Rubber tubing extra soft	1*6mm	Vijay
		1*9mm	
63.	Pressure tubing	1*8 x 3mm	Vijay
		1*6.5 x 3mm	
64.	Rubber Adapters	6*250ml	Vijay
		6*500ml	
		6*1000ml	
65.	Graphite fine powder, EP	1*500gm	Loba
66.	Glutraldehyde, 25%	1*500ml	Loba
67.	L-Ascorbic acid 99.5% AR	1*100gm	Loba
68.	Isopropyl Alcohol, lichrosolv	5*1ltr	Merck
69.	Acetone, lichrosolv	3*1 ltr	Merck
70.	Acetic acid, lichrosolv	5*1ltr	Merck
71.	Acetonenitrile, lichrosolv	10*1ltr	Merck
71.	Formic acid, Emsure	2*1ltr	Merck
72.	Methanol, lichrosolv	10*1ltr	Merck
73.	Chloroform, lichrosolv	5*1ltr	Merck
74.	Tetra hydrofuram (THF), lichrosolv	5*1ltr	Merck
75.	Toluene, lichrosolv	3*1ltr	Merck
76.	Potassium hydrogen phthalate, Emsure	3*500gm	Merck
77.	EDTA LR	2*500gm	Merck
78.	Ammonia Solm, 25% Emearta	1*5ltr	Merck
79.	Ammonia Solm, 25% Emearta	1*500ml	Merck
80.	Paraffin liquid light	1*500ml	Merck
81.	Paraffin liquid Heavy	1*500ml	Merck
82.	Buffer Capsules pH 4.0	2*10 Caps	Merck
83.	Buffer Capsules pH 7.0	2*10 Caps	Merck
84.	Buffer Capsules pH 9.2	4*10 Caps	Merck
85.	Agar	3*100gm	Sigma
86.	Chitin from shrimp shells, practical gra	1*500gm	Sigma
87.	Allyl Chloride, reagentplus	4*100ml	Sigma
88.	Benzoyl peroxide, 75% reminder water	1*100gm	Sigma
89.	Potassium bromide, 99+%, FT-IF grade	1*100gm	Sigma
90.	Sodium Tripolyphosphate, Tech, 85%	1*500gm	Sigma
91.	Sodium Acetate anhydrous	1*250gm	Sigma
92.	2-Vinylpyridine, 97%	1*500gm	Sigma
93.	1-Vinylimidazole, 99+%	1*100gm	Sigma
94.	Sodium Nitrate, AR 98%	1*500gm	Sigma
95.	Potassium Nitrate, AR 99.5%	1*500gm	Sigma
96.	Titanocene dichloride, 97%	1*10gm	Sigma

97.	Beakers with spouts	15*10ml	Borosil
		15*25ml	
		15*50ml	
		15*100ml	
		15*250ml	
		15*500ml	
		5*1000ml	
98.	Burettes	5*10ml	Borosil
		10*25ml	
		10*50ml	
		5*100ml	
99.	Conical Flask	12*100ml	Borosil
		12*500ml	
		12*250ml	
100.	Funnels	12*50mm	Borosil
		12*75mm	
101.	Glass roads	20*7 x305mm	Borosil
		20*7 x255mm	
102.	Measuring Cylinders	10*5ml	Borosil
		10*10ml	
		10*25ml	
		10*50ml	
		5*100ml	
103.	Pipettes	12*1ml	Borosil
		12*5ml	
		12*10ml	
		12*25ml	
104.	Reagent bottles with screw caps & pouring	12*100ml	Borosil
		12*250ml	
		12*500ml	
		6*1000ml	
105.	Volumetric Flasks	12*10ml	Borosil
		12*20ml	
		12*100ml	
		12*250ml	
		6*500ml	
		3*1000ml	
106.	Wash Bottle (166p)	12*500ml	Borosil
107.	Culture tube bottles (Flat bottom)	100*5ml	Borosil
		100*15ml	
		100*30ml	
108.	Culture tube bottles (Flat bottom) (amber)	50*15ml	Borosil
109.	Amber Bottles	5*500ml	Borosil
		5*250ml	
110.	Condenser ID24/ 29,OD24/29	5*400mm	Borosil
		5*300mm	
111.	Condenser ID19/ 26, OD19/26	5*200mm	Borosil
112.	Round Bottom Flasks short neck ID24/29	5*250ml	Borosil
		5*500ml	
113.	Round Bottom Flasks short neck ID19/26	5*250ml	Borosil
		5*500ml	

114.	Round Bottom Flasks three neck C-24/29, S19/26	5*500ml	Borosil
		5*250ml	
115.	Filtering flask bolt neck	2*250ml	Borosil
		5*1000ml	
		5*500ml	
116.	Erlenmeyer flasks with stoppers	5*25ml	Borosil
		5*50ml	
		5*100ml	
		5*250ml	
117.	Desiccators (3082) ID200	2Nos.	Borosil
118.	Desiccators (Vacuum) (3083) ID200	1 Nos.	Borosil
119.	Slopping plane still head F24/29, C24/29, T19/26	5 Nos.	Borosil
120.	Adaptor, Receiver Bent with vacuum connection (8830)	5 Nos.	Borosil
		5 Nos.	
		5 Nos.	
121.	Test tube with rim	100*15ml	Borosil
122.	Digital Micro Pipette (100-5000µl)	1 Nos.	Borosil
123.	Petridish	25*50mm	Borosil
		25*100mm	
124.	Iodine flask with stopper	5*250ml	Borosil
125.	Aluminium oxide, nano powder <50nm(Tem)	1*50gm	Sigma
126.	Silicon dioxide, nano powder 10-20nm PAR	1*50gm	Sigma
127.	Whatman filter paper grade no.1	1*9cm	-
128.	Soxhlet Extraction, Extractor 200ml, Flask 500ml, Condenser 250mm	2 Nos.	J-Sil
129.	Test tube with or W/O rim	50*25 x 150mm	J-Sil
130.	Test tube with rim	50*25x200mm	J-Sil
131.	Karl Fischer Reagents	1*500ml	Himedia
132.	Methanol, Ar Srl	2*2.5 Ltr.	SRL
133.	Chloroform, Srl	1*2.5 Ltr	SRL
134.	CTAB, Srl	1*100gm	SRL
135.	Acetic Acid Glacial, AR	4*2.5 Ltr	Sd's
136.	Ammonium Bicarbonate, LR	1*500gm	Sd's
137.	Ammonium Carbonate, LR	1*500gm	Sd's
138.	Calcium Chloride, LR	5*500gm	Sd's
139.	Iron (iii) Chloride, LR Anhydrous	1*500gm	Sd's
140.	Hydrochloric Acid, AR	8*500ml	Sd's
		4*2.5ltr.	
141.	Hydrochloric Acid, LR	8*500ml	Sd's
		4*2.5Ltr.	
142.	Nitric Acid, AR	8*500ml	Sd's
		4*2.5Ltr.	
143.	Nitric Acid, LR	4*2.5Ltr.	Sd's
144.	Potassium Chloride	12*500gm	Sd's
145.	Potassium Chloride, AR	4*500gm	Sd's
146.	Potassium Dichromate, LR	8*500gm	Sd's
147.	Potassium Permanganate, LR	7*500gm	Sd's
148.	Sodium Bicarbonate, LR	4*500gm	Sd's
149.	Sodium Chloride, AR	4 *500gm	Sd's
150.	Sodium Chloride, AR	1*5kg	Sd's
151.	Sodium Hydroxide, AR Pellets	4*500gm	Sd's
152.	Sodium Nitrate, AR	4*500gm	Sd's
153.	Sulphuric Acid, AR	8*500ml	Sd's

154.	Sulphuric Acid, LR	8*500ml	Sd's
155.	Sulphuric Acid, LR	4*2.5Ltr.	Sd's
156.	Pyrene for Fluorescence	2*1gm	Sigma
157.	Mercury	1*100gm	Sigma
158.	Benzophenone Reagent Plus	1*1kg	Sigma
159.	Specctrosol E, HPLC	2*500ml	Sigma
160.	Chitosan, low mol.wt	1*50gm	Sigma
161.	Carrageenan, Commercial grade	1*25gm	Sigma
162.	B-Cyclodextrine	1*25gm	Sigma
163.	Acetic Acid Glacial, LR	1*6 x 500ml	Sigma
		1*4 x 2.5Ltr.	
164.	Acetic Acid Glacial, AR	1*6 x 500ml	Sigma
165.	Acetone, LR	1*6 x 500ml	Sigma
		1*4 x 2.5Ltr	
166.	Acetone, AR	1*6 x 500ml	Sigma
		1*4 x 2.5Ltr	
167.	Ammonium Carbonate, AR	1*500gm	Sigma
168.	Calcium Chloride Dihydrate, LR	1*500gm	Sigma
169.	Magnesium Chloride Hexhydrate, AR	1*500gm	Sigma
170.	Oxalic Acid, AR	2*500gm	Sigma
171.	Potassium dichromate, AR	4*500gm	Sigma
172.	Potassium hydroxide, AR Flakes	8*500gm	Sigma
173.	Potassium Iodide, AR	1*500gm	Sigma
174.	Silver Nitrate, AR	1*25gm	Sigma
175.	Sodium Carbonate, LR	4*500gm	Sigma
176.	Sodium Carbonate, AR	4*500gm	Sigma
177.	Sodium Chloride, LR	3*500gm	Sigma
178.	Sodium Hydroxide, AR Pellets	2*1kg	Sigma
179.	Sodium Nitrate, LR	2*500gm	Sigma
180.	Sodium thiosulphate, AR	4*500gm	Sigma
181.	Starch, LR from potato soluble	1*500gm	Sigma
182.	Zinc Chloride, LR	4*500gm	Sigma
183.	Hydrogen Peroxide Solution, AR	6*500ml	Loba
184.	Nitric Acid, LR	8*500ml	Loba
185.	Sulphuric Acid, AR	4*2.5Ltr	Loba
186.	Span 60	1*500gm	Loba
187.	Lecithin Soya, 30%	1*100gm	Himedia
188.	Olive oil	1*100ml	Himedia
189.	Tween 80	1*100gm	Himedia
190.	Carbopol 940	1*500gm	Himedia
191.	Epichlorohydrine, 90% AR	1*500ml	Loba
192.	Sodium Dodecyl Sulphate, Extra Pure 85%	1*500gm	Loba
193.	Adapter Received Bent with socket S-19/26, C-24/29	2 Nos.	J-Sil
194.	Adapter Received Bent with socket 24/29, C-24/29	2 Nos.	J-Sil
195.	Stock-Cock with vacuum straight Bore	1*2mm	J-Sil
		1*3mm	
196.	Condenser Leibig with i/c joint 24/	3*300mm	J-Sil
197.	Connection Tube T shape	2*5 x 8mm	J-Sil
198.	Sloping Plain Still Head FC 24-29-26	3 Nos.	J-Sil
199.	Adapter Received Bent with socket 24/29, C-24/29	3 Nos.	J-Sil
200.	Stopers Hexagonald 19/ 26	6 Nos.	J-Sil
201.	Kjeldhai Distillation Assembly	1 Nos.	J-Sil

202.	Stopers Hexagonald D24/29	6 Nos.	J-Sil
203.	Mercury Seal Glands C-1626	2*6mm	J-Sil
204.	Mercury Seal Glands C24/29-9	2*6mm	J-Sil
205.	Adaptor Receiver Plain Bend 19/26	2 Nos.	J-Sil
206.	Adaptor Receiver Plain Bend 24/29	2 Nos.	J-Sil
207.	Adaptor Receiver Bent with vacuum connection bend S-24/29, C24-29	3Nos.	J-sil
208.	Plain Still Head Sloping 24/29	2Nos.	J-Sil
209.	Air/Steam Intel Tubes bent C14/23	2 Nos.	J-Sil
210.	Condenser Liebig 24/29	2*300mm	J-Sil
211.	Chromatography Columns with sintered disk B-10mm, L-300mm	1 Nos.	J-Sil
212.	Fractionation Columns Vigrex S-24/29, L400	1 Nos.	J-Sil
213.	Flask R.B. Short /Medium 24/ 29	2*500ml	J-Sil
214.	R.B. Flask Imported Plain Make	2*2000ml	J-Sil
215.	Socket Plain Shank Double 24/29	2*80mm	J-Sil
216.	Cone Plain End Double 24/29	2*80mm	J-Sil
217.	Cone Adaptor Straight Connection Plain D-24/29	2 Nos.	J-Sil
218.	Gas Wash Bottles	1*250mm	J-Sil
219.	Adaptor Receiver Plain Bend Socket S-19/2	2 Nos. 2 Nos.	J-Sil
220.	Adaptor Receiver Plain Bend S-24/29/,C-24	2 Nos.	J-Sil
221.	Copper (ii) Sulphate Anhydrous	1*500gm	Himedia
222.	Nutrient Agar	1*500gm	Himedia
223.	Nutrient Broth	1*100gm	Himedia
224.	Basic Bismuth Carbonate	1*100gm	Himedia
225.	Sodium Potassium Tartarate	1*500gm	Himedia
226.	1-Napthol PG C-69	1*100gm	Himedia
227.	Sodium Iodide	1*100gm	Himedia
228.	Lactic Acid 88% Extra Pure	2*500ml	Loba
229.	Dialysis Membrane - 70	1*5Mtr.	Himedia
230.	Inorganic Membrane Filter, Aotop-25	2Pkt.	Sigma
231.	Epichlorohydrin	1*500ml	Loba
232.	Formaldehyde	4*500ml	Loba
233.	Bisphenol A, 98% Pure	2*500ml	Loba
234.	Toluene, 99.5% AR	1*2.5Ltr. 1*500ml	Loba
235.	Thymolphthalein Indicator, AR	1*25gm.	Loba
236.	Silicone high vacuum grease	5*50gm	Loba
237.	Methanol, 99.6% AR	2*500ml	Loba
238.	Calcium Sulphate (Dihydrate), 98%	2*500gm	Loba
239.	Calcium Sulphate (Dihydrate)	2*500gm	Loba
240.	Specific Gravity Bottle 5 ml	5 Nos.	Vijay
241.	Specific Gravity Bottle 10ml	5 Nos.	Vijay
242.	Specific Gravity Bottle 25ml	5 Nos.	Vijay
243.	Capillary Both and Open	5 Nos.	Vijay
244.	Capillary for Melting Point	3 Nos.	Vijay
245.	Laboratory Tubes	1 kg	Vijay
246.	Mortar & Pestle	1 Nos.	Vijay
247.	Tripod Stand 7 x ‘5’’	6 Nos.	Vijay
248.	Evaporating Dish 125ml	6 Nos.	Vijay
249.	HPLC Bottles Pressure Plus	2* 500ml	-
250.	UREA AR	1*500gm	Himedia
251.	Universal Indicator	1* 100ml	Himedia

252.	Melamine	1* 500gm	Himedia
253.	Bisphenol A	1* 500gm	Himedia
254.	Formaldehyde	1*500ml	Himedia
255.	Sodium Hypochlorite	1*1Ltr.	Himedia
256.	Activated Charcoal Powder, LR	1*500ml	Himedia
257.	Dichloromethane	1*500ml	Himedia
258.	Sodium Sulphate	1*500gm	Himedia

7c. Details of Research Infrastructure developed out of PURSE Support:

Central Experimental Facility: DST PURSE Programme

Sr. No.	Received Items	Make	Cost (INR)
1.	Table and Chairs for Seminar Hall	-	15,900.00
2.	1. FBG 301 Recessed White 2 x 14 2. Essential 18W/86 ES	-	7,539.00
3.	Dharmendra M Patel	-	2,28,930.00
4.	Air Conditioners (2 Nos.) for Instrument lab	Blue Star	74,000.00
5.	Dharmendra M Patel	-	1,26,378.00
6.	Vacuum Pressure Pump with Kit	Millipore	29,097.00
7.	1. Ultrasonic Cleaning Bath (Model: # UCB-35), Cap. 3.5 Ltr, Operating Frequency 33 3KHz, Temp. Range + 5 to 60 c (1 Nos.) 2. Heating Mantle with Energy Regulator, (Model: #HM-2, Cap 2Ltrs, Rating 450W (2 Nos.), (Model: #HM-5, Cap 5Ltrs, Rating 600W (2 Nos.) 3. Hot Magnetic Stirrer (Model:#MS-313(CC), Cap. Upto #3 Ltrs, Plate Size: 180 X 180mm, Surface Temp. Upto 380˚C (Max), Maximum approx speed (RPM) 1500, Temp. Controller Energy Regulator (1 Nos.) 4. Hot Air Oven Universal, Model:#OUD-95, Internal Dimension W x D x H (mm), 455 x 455 x 455mm, Cap. 9.5 Ltr, With Microprocessor (1 Nos.)	MAC	1,34,663.00
8.	Refrigerator 230 Litre (2 Nos.) (For Instrument lab.)	Samsung	35,000.00

9.	1. C-30 plus, max. Speed 20,000, max RCF-37570 temp. Upto 8d c. Control microprocessor display LED, recommended stabilizer VS-03 (1 Nos.) 2.R-238M complete with polypropylene tubes 12 x 50ml (1 Nos.) 3.R-244M complete with polypropylene tubes 12 x 15ml (1 Nos.) 4.R-248M complete with polypropylene tubes 24 x 1.5ml (1 Nos.)	Remi	1,87,572.00
10.	1. Kinematic Viscometer Bath for 4 Viscometer 2. Holder for Viscometer	Vijay	66,224.00
11.	1. Condensers Vertical Distillate (2 Nos.) 2. R. B. Flask Two Necks, Centre and One Angle (2 Nos.) 3. Stopers Hexagonal D24/ 29 (4 Nos.) 4. Stopers Hexagonald 19/26 (4 Nos.) 5. Cone Adapters Straight Connectio Plane D-24/29 (1 Nos.) 6. Cone Adapters Straight Connectio Plane D-24/29 (1 Nos.) 7. Air/ Steam Inlet Tube Bent D-24/29 (1 Nos.) 8. Air/ Steam Inlet Tubes Straight D-24/29 (1 Nos.)	J-Sil	9,710.00
12.	Water tap 3-way Swan Neck (6 Nos.)	Vijay	11,781.00
13.	1. PH Meter (1 Nos.) 2. Conductivity/ TDS Model: upCon cal10 (1 Nos.) 3. Conductivity Cell with Cell Constant K=0.1 (1 Nos.) 4. Karl Fischer Titrator-Model: AquaCal (1 Nos.)	Analab	1,20,067.00
14.	Magnetic Stirrer with Digital Speed Indicator (6 Nos.)	Remi	26729.00
15.	1. Heating Mantles Cap.250ml (3 Nos.) 2. Heating Mantles Cap.500ml (3 Nos.) 3. Heating Net with Coil (spare) 250ml (3 Nos.) 4. Heating Net with Coil (spare) 500ml (3 Nos.) 5. Heating Net with Coil (spare) 5Liter (2 Nos.)	Lab Equip Techno Craft (LTC)	13,353.00
16.	Renovation Work of Room No. 108 (Cell Culture Lab)	-	89,073.00
17.	Ventilair DX 250MM 10'' Fan Exhaust Fan (2 Nos.)	Havells	2,520.00
18.	Renovation Work (Cell Culture Lab)	-	6,81,084.00
19.	Electrification work of Lab No. 108 of Purse Programme (G. F. of Old Biosciences Department) of Sardar Patel University		1,03,221.00
20.	LED Lights (12 Nos.) (For lab)	Havells	18,900.00
21.	Exhaust Fan (03 Nos.)	Crompton	8,700.00

22.	Precision Balance (01 Nos.)	J. J. Labware	63,304.00
23.	Reptech Brand Electronics Balance (02 Nos.)	Sun	46,125.00
24.	Acrylic door cover notice board with Astel anodized aluminium frame Size 3x3 feet (10 Nos.)	All Ark	45,200.00
		Total Rs.	**21,45,370.00**

7d. Details of Networking & Computational Facilities created out of PURSE Support: Central Experimental Facility: DST PURSE Programme

Sr. No.	Details of the items procured for Computer Laboratory	Make	Date of Purchase	Total Cost (INR) (Total Cost of the item/ Equipment after paying all charges)
1.	Quickheal (1 Nos.), CD Folder (2 Nos.)	-	11-02-2013	3,200.00
2.	Networking Service & N/W Cable UTP CAT6-N	-	11-03-2013	6,575.00
3.	600VA UPS With 15 Mins. Backup – Battery (8 Nos.) (For computer & Networking Lab.)	APC	16-04-2013	16,400.00
4.	600VA UPS With 15 Mins. Backup – Battery (10 Nos.) (For computer & Networking Lab.)	APC	19-07-2013	20,500.00
5.	P.V.C Vinayal Floring Carpet (1.3 m. m.) (260 Sq. Feet)	-	24-08-2013	10,400.00
6.	Dell Poweredge T620, MID Level Intel Server (S2) (1 Nos.)	Dell	12-08-2013	2,58,400.00
7.	Desktop Computer (D2) (18.5') (10 Nos.) (for Networking Lab.)	Dell	17-07-2013	4,28,220.00
8.	Scanner Visiting Card (1 Nos.)	-	04-12-2013	5,500.00
9.	Notebook HP Split 13-M008 TU x 2 (1 Nos.)	HP	06-01-2014	68,800.00
10.	Keyboard & Mouse (1 Nos.)	HP	03-02-2014	1,800.00
11.	1500VA Inverter (1 Nos.) (As a back up for Computer & Networking lab)	SUKAM	28-02-2014	32,500.00
			Total Rs.	**8,52,295.00**

8. Details of Utilization of PURSE Grant under 'Fix Component'

8a. Particular of Manpower Employed:

Sr. No.	Designation (Number of Persons)	Monthly Emoluments (INR) per person
1.	Research Associates (Three)	22,000.00
2.	Retired Scientists (Three)	20,000.00
3.	Junior Research Fellows (Two)	16,000.00
4.	Research Scientist II (One)	14,000.00
5.	Research Assistants (Seventeen)	12,000.00
	Total Amount sopent on Manpower (as on 12th February, 2014)	**30,04,592.00**

8b. Details of Expenditure incurred under 'Travel':

Sr. No.	Particular of Man Trips	Total Cost (INR)
1.	Mr. Dhrumit S. Bhatt (Res. Assistant) Conference Participation	4,220.00
2.	Prof. Dr. N. V. Sastry (Nodal Officer), S. P. University, Vallabh Vidyanagar Visit to PRL	926.00
3.	Dr. Pinaki B. Patel (Res. Associate) Conference Participation	9,502.00
4.	Miss. Krutika L. Bhole (Res. Assistant) Conference Participation	4,324.00
5.	Prof. Dr. ShyamLal, PRL, Ahmedabad Visitor to CISST	3,106.00
6.	Prof. Dr. ShyamLal, PRL, Ahmedabad Visitor to CISST	2,398.00
7.	Prof. Dr. Ramchandran, PRL, Ahmedabad Visitor to CISST	3,106.00
8.	Prof. Dr. Ramchandran, PRL, Ahmedabad Visitor to CISST	3,106.00
9.	Prof. Dr. Ramchandran, PRL, Ahmedabad Visitor to CISST	3,106.00
10.	Prof. Dr. E. Arunan, PRL, Ahmedabad Visitor to CISST	4,106.00
11.	Prof. Dr. J. J. Shah Visitor to CISST	1,500.00
12.	Mrs. Disha D. Patel (Res. Assistance) Conference Participation	4,264.00
13.	Prof. Dr. N. P. Bhatt, M. S. Uni. Of Baroda, Vadodara Visitor to CISST	2,592.00
14.	Prof. Dr. Shyamlal, PRL, Ahmadabad Visitor to CISST	3,106.00
15.	Prof. Dr. N. V. Sastry (Nodal Officer), S. P. University, Vallabh Vidyanagar Conference Participation	19,669.00
16.	Prof. Dr. N. V. Sastry (Nodal Officer), S. P. University, Vallabh Vidyanagar Visit to PRL	2,500.00
	Total Rs.	**71,531.00**

8c. Any Seminar/ Workshop/ Conference Organized by the University during the period of Report, especially those involving the newly created facility under PURSE Initiative:

Sr. No.	Description of Seminar/ Workshop	sponsors	Duration	Budget Allocated (INR)
DST-PURSE Programme				
1.	National Conference on Interdisciplinary Perspectives: Defence Studies, Earth System Science And Bio-medical Science (IPDEB-2013)	DST-PURSE Programme	15th to 17th November 2013	3,29,335.00
2.	Emerging Trends & Prospects in Studies in Interdisciplinary Science & Technology (ETPSIST-2014)	DST-PURSE Programme	4th March 2014	81,118.00
Department of Bioscience				
3.	Virtual Workshop on 'Art of Science Communication'	American Society for Microbiology (ASM), Association of Microbiologists of India (AMI) , BRD School of Biosciences	Saturday, February 22, 2014	-
Department of Chemistry				
4.	UGC sponsored Three Day National Seminar on Novel Drug Delivery Systems and Trends in Chemical Sciences	UGC	24th -26th March 2014	-
5.	DST – SERB Winter school on Computational chemistry	DST- PURSE	9th -13th December 2013	-
Department of Home Science				
6.	Nutrigenomics: A Promising Tool for Combating Chronic Disease	UGC-Innovative Program + SAP DRS-I + Unassigned grant + private parties	3rd to 4th February 2014	-
Department of Statistics				
7.	Research in Statistical Science: Past, Present and Future (RSSP^2F-2014) (National Level)	UGC (SAP-DRS-I)	21st to 22nd February 2014	-
Department of Mathematics				
8.	Workshop on Art on Problem Solving in Mathematics	UGC(SAP-DRS-2)	16th to 21st January 2014	-
9.	Seminar on Analysis, Geometry and Applications	UGC(SAP-DRS-2)	17th to 18th February 2014	-
Department of Physics				
10.	Seminar on Condensed Matter Physics & Training School on X-Ray Diffraction Techniques	UGC	03rd to 08th March 2014	-

8d. Details of Budget for Contingencies

Sr. No.	Description of Details (Item Wise)	Total Cost (INR)
1.	Hiring Services i. Clerk (Nil) ii. Peon (Two: on daily wages @150Rs. Per day) iii. Administrative Office Charges	1,01,500.00
2.	Stationery	5,314.00
3.	Postal Charges, Miscellaneous & Sundry Expenses	1,06,488.00
	Total Rs.	**2,13,302.00**

Please see below for the details of expenses made:

Sr. No.	Particulars	Quantity	Cost (INR)
Hiring Services (Administration Office Charges)			
1.	Salary (01-03-2013 to 31-03-2013), Nilesh F. Rabari, Shreyansh P. Parekh	02	7,150.00
2.	Salary (01-04-2013 to 30-04-2013), Nilesh F. Rabari, Shreyansh P. Parekh	02	8,000.00
3.	Salary (01-05-2013 to 31-05-2013), Nilesh F. Rabari, Shreyansh P. Parekh	02	8,000.00
4.	Salary (01-06-2013 to 30-06-2013), Nilesh F. Rabari, Shreyansh P. Parekh	02	7,500.00
5.	Salary (01-07-2013 to 31-07-2013), Nilesh F. Rabari, Shreyansh P. Parekh	02	8,100.00
6.	Salary (01-08-2013 to 30-08-2013), Nilesh F. Rabari, Shreyansh P. Parekh	02	7,200.00
7.	Administration Charges 10% of Contingencies	03	20,000.00
8.	Salary (01-09-2013 to 30-09-2013), Nilesh F. Rabari, Shreyansh P. Parekh	02	7,500.00
9.	Salary (01-10-2013 to 25-10-2013), Nilesh F. Rabari, Shreyansh P. Parekh	02	6,000.00
10.	Salary (01-11-2013 to 30-11-2013), Nilesh F. Rabari, Shreyansh P. Parekh	02	6,900.00
11.	Salary (02-12-2013 to 31-12-2013), Nilesh F. Rabari, Shreyansh P. Parekh	02	7,050.00
12.	Salary (01-01-2014 to 31-01-2014), Nilesh F. Rabari, Shreyansh P. Parekh	02	8,100.00
Stationery			
14.	Zeel Xerox & Stationers, Vallabh Vidyanagar (Nos. shown in Paraenthesis) L Folder (24), Sticker Pad (01), Hooks (24), Ball Pen (01), Paper Weight (06), Scale (01), DP 800 Punch Pen (01), Spiral (03), Writing Pen (06),		1,881.00
15.	Correction Pen (02), Cello Tape (04), Spiral Binding(01), Lamination(10), Registrar Hard Bound(01), Brown Cello Tape(01), Strip Binding(09), Strip Binding(20), Copy power Paper(05), Lamination(02), Spiral Binding(01), Cutter(03), C. D.(06), Pencil(01 Box), Note Book(01), Marker Pen(05), Hard Bound Note Book(02), Plastic File(02), file(06), White Board Marker(09),		3,433.00
Postal Charges, Miscellaneous & Sundry Expenses			
16.	Miscellaneous Bill (Numbering on Equipment, Furniture & Computer)	300	3,000.00

17.	Miscellaneous Bill (Printing Visiting Cards (1000), Letter Head (2000), A4 (12'' x 10'') Size White Printed Postal Covers (1000), Small (11'' x 5'') White Printed Postal Covers (1000)	5,000	10,924.00
18.	Postal Charges	59	596.00
19.	Sundry and Miscellaneous (Items for arranging meetings and conference)	-	24,721.00
20.	Banner strip & Electrical wire box	03	1,050.00
20.	Refill Toner (Om Enterprise, Anand)	01	400.00
21.	Refill Toner (Om Enterprise, Anand)	02	900.00
21.	Advertisement bill	01	600.00
22.	Advertisement bill	01	4,158.00
23.	Wooden rack for Foot wear(1Nos.), File Rack (02 Nos.)	03	8,000.00
24.	Refill Toner (Om Enterprise, Anand)	08	5,400.00
25.	Adjustment bill Miscellaneous	-	20,000.00
26.	Canon NPG 51 Toner (2785B001AA)	01	3,596.00
27.	Sample for TEM Analysis	02	2,247.00
	Copper Grid	02	
	Image on CD (TEM)	06	
28.	Canon NPG 51 Toner (2785B001AA) (Rutuman Enterprise, V. V. Nagar)	01	3,596.00
29.	HP Laser Jet Cartridge (Colour) (Western Marketing, Anand)	04	14,000.00
30.	Refill Toner (Om Enterprise, Anand)	02	900.00
31.	Registration Fees (Dr. Rupal A. Vasant, Assistant Professor, CISST, S. P. University, V. V. Nagar)	01	1,200.00
32.	Registration Fees (Dr. Rakesh V. Patel, Assistant Professor, CISST, S. P. University, Vallabh Vidyanagar)	01	1,200.00
		Total Rs.	**2,13,302.00**

8e. Particulars of Funds utilized for 'Maintenance' Purpose:

Sr. No.	Details of Maintenance	Department	Cost (INR)
1.	Annual Maintenance Contract (AMC) of Reverse Osmosis System Capacity 20 Litter (Worldlink Marketing Co., Vithal Udyognagar, Anand	DST-PURSE Programme S. P. University	6,000.00
2.	DCATIIEC Surface Tensiometer (Dataphysics, Germany)	Chemistry	2,58,934.00
		Total Rs.	**2,64,934.00**

9. Utilization of the facilities created under PURSE Program Support:

(a) The facility of LCMS is in extensive use by the researchers from other departments of SPU. About 358 samples have been analysed.

(b) The facility of Rheometer (Modular Compact Rheometer, Anton Paar) is in extensive use by the researchers from other departments of SPU.(Department of Chemistry, Department of Bioscience, Department of Pharmaceutical Sciences) About 951 samples are analysed.

(c) The sample analysis services with above instruments has also been provided to researchers from the Charusat University, Changa and M.S.Unuiversity, Baroda.

(d) The detailed progress report of the work in progress by the research personnel appointed under DST PURSE programme is attached herewith in a separated booklet entitled **Summary of Ongoing Research Work by Personnel appointed under PURSE Programme, Sardar Patel University, Vallabh Vidyanagar.**

10. Details of full length Research Publication (in Peer- Reviewed Journals) during the Period under report:

An Overview

[A] Articles/Papers published in Academic Journals

Sr. No.	Department	Published	In Press
1.	Biosciences	63	9
2.	Chemistry	54	1
3.	Computer Science	37	-
4.	Electronics	2	-
5.	Materials Science	6	-
6.	Mathematics	14	-
7.	Physics	57	2
8.	Homescience	8	-
9.	Statistics	11	2
	Total	252	14

[B]Books/Chapters in Book

Sr. No.	Department	Books	Chapters in Book
1.	Biosciences	01	01
2.	Computer Science	04	01
3.	Mathematics	-	-
4.	Physics	-	-
5.	Homescience	-	05
6.	Chemistry	-	-

For the details of publications please see Annexure- I (Page Nos. 28 to 47)

11. Sponsored research projects in operation during the period under report (please provide names of PI/Co-PIs, title of the project, funding agency and total quantum of external support)

An Overview

Sr. No.	Department	Sponsored Research Projects (Ongoing / New) (Nos.)	Total Grant (Rs.)	Sponsoring Agency
1.	Biosciences	12	5,44,60,500.00	DBT New Delhi, DST New Delhi, UGC New Delhi, GSBTM Gandhinagar, MOFPI – DST(SERB) New Delhi
2.	Chemistry	11	1,06,43,800.00	UGC New Delhi, UGC – DAE Consortium for Scientific Research, Mumbai Center, R-5 Shed, BARC, Mumbai, SERB, DST, New Delhi (DST Young Scientist Award)
3.	Home Science	02	22,03,000.00	UGC, DBT
4.	Materials Science	05	4,84,20,000.00	UGC New Delhi, IPR-BRFST
5.	Physics	08	95,84,792.00	UGC New Delhi, DAE-BRNS, DST-PURSE SPU.
6.	Electronics	02	15,58,800.00	UGC, DST-PURSE Programme,SPU
7.	Statistics	01	11,95,800.00	UGC
	Total	**41**	**12,80,66,692.00**	

Please see Annexure-II for the details, Project wise (Page Nos. 48 to 52)

12. Utilization of Equipments by other institutes:

The facility of LCMS, Rheometer is in use by the researchers from other Universities like MS University, Vadodara (around 20 Samples for LCMS and around 36 Samples for Rheometer), CHARUSAT- Changa University, Changa (around 6 samples for rheological analysis)

13. Self assessment of the impact of the PURSE support:

13 a. Success of the students at national level tests (various PG/Ph.D. entrance tests and tests for JRF etc) during the April 2013 to March 2014.

Sr. No.	Department	PG	Ph. D.	NET	GATE	SLET
1.	Chemistry	-	25	01	01	-
2.	Electronics	-	-	-	-	-
3.	Home Science	-	04	03	-	01
4.	Materials Science	-	-	-	-	-
5.	Physics	-	-	-	-	-

6.	Mathematics	-	-	-	02	01
7.	Biosciences	04	01	04	-	01
8.	Statistics	-	-	-	-	-
9.	Computer Science	-	10	-	-	-

13 b. Any other new innovation/research projects that emerged on the basis of PURSE support:

For the meaningful implementation of the DST-PURSE Programme, the University has established the Center for Interdisciplinary Studies in Science and Technology(CISST) which, on one hand, houses Centeral Experimental Facilities consisiting the equipment under DST-PURSE Programme so as to facilitated research with an optimum use of the facilities; on the other hand, it is mandatory to carry out the relavent academic activities to promote interdisciplinary activities. The following is a brief of the academic activities carried out under CISST.

(1) Interdisciplinary Research in Progress

The Research in progress during 2013-14 at CISST by the research Personal Appointed under DST-PURSE Programme is briefly described below

Sr No.	Name and Position	Theme
1.	Dr S.J.Bhatt Retired Scientist	1. Differential structure inC*-algebras 2. Fractality and Allometry in some Biological systems and processes 3. Fractal Analysis in Finacial Market
2.	Dr. A.T.Oza Retired Scientist	Organic, metal-organic and polymeric conductors
3.	Dr. K.S.Rao Retired Scientist	To study the cambial activity
4.	Dr. K.N.Joshipura Retired Scientist	Electron impact processes in atomic-molecular Physics Theoretical studies and planetary applications
5.	Dr. Rupal A. Vasant Research Associate	Role of *Withania somnifera* in fluoride induced hyperglycemia in Albino rats
6.	Dr. Purvesh Bharvad Research Associate	Evalution of antimicrobial activity and phytochemical analysis of selected Indian medicinal crude plant extracts
7.	Dr.Pinaki Patel Research Associate	To study the effect of chemotherapeutic drug and phytochemical on survival of *S.pombe* cells and its mechanism of action
8.	Dr. Deep Shah Research Associate	Chitosan Hydrogels: Preparation, Characterization and evalution for drug based formulations
9.	Mili Vyas Research Assistant	
10.	Soumya Menon Research Scientist-II	Biochemical and Histo-architectural analysis of melons in relation to their development and ripening
11.	Megha Vaidya Junior Research Fellow	*In Silico* structure and Functional analysis of *Helicobacter Pylori* Proteins responsible for Gastro Intestinal Tract disease in Human.
12.	Pradeep Mackwan Junior Research Fellow	Amphiphilic inoinc liquids: Synthesis and evaluation of colloidal aspects.
13.	Anjali Thakkar Research Assistant	Phytochemical analysis, antimicrobial and antioxidant potential of fruit and peel extract of *Trapa bispinosa* Roxb.

14.	Bhavesh Patel Research Assistant	Room temperature synthesis of silver nanoparticles.
15.	Dharmesh Parmar Research Assistant	
16.	Disha Patel Research Assistant	Study of jasmonic acid biosynthesis pathway from *Lasiodiplodia theobromae*
17.	Gulshan Patel Research Assistant	Model based process monitoring and control for artifial ripening of the *Mangifera indica* (L.) [Mango] focusing on concentration of ethylene-a mini review and future perspectives
18.	Hetul Suthar Research Assistant	Smart & Self-Responsive system based on Programmable Logical Controller and Android for efficient Agricultural Practices.
19.	Jigisha Vaghela Research Assistant	Melittopalynological Analysis of Honey Collected from *Apis florae* bee hives in Kachchh district, Gujarat
20.	Jignesh Panchal Research Assistant	Development of gas/vapour sensors using the oxide semiconductors with possible extended study of the response of tin metal to mechanical and electrical stimuli
21.	Kaushik Jodhani Research Assistant	Evalution of biosafe products as an alternate stratergy to improve the post harvest quality and shelf life of some perishable horticultural produce
22.	Krutika Bhole Research Assistant	Studies on the ACE inhibitory and Antioxidant potential of seasonal fruits.
23.	Nilanjana S. Baraiya Research Assistant	Improvement of health promoting properties and enhancement of shelf life of short lived tropical fruits and vegetables by using some innovative post harvest technologies.
24.	Pinal Vyas Research Assistant	Improvement of nutritional characteristics and extension of shelf life of perishable tropical fruits and vegetables by using post harvest elicitors and edible coatings.
25.	Sagar Patel Research Assistant	Database designing and analysis of dat for Leguminosae family members present in Gujarat state by various Bioinformatics tools
26.	Sonu Sharma Research Assistant	Antioxidant enrichment and Antimicrobial protection of fresh-cut fruits and vegetables using innovative approaches.
27.	Sujit Prajapati Research Assistant	Ecological studies on selected Wetlands of the Central Gujarat.
28.	Swati Kurtkoti Research Assistant	Comparative study of properties of topically applied organogels and hydrogels for drug delivery

The detail of the work being carried out is described in the separate booklet attached herewith.

(2) Confrences Organized

(a) Emerging Trends and Prospectus in Studies in Interdisciplinary Science and Technology (ETPSIST) was held on 4th March 2014.

This conference consisted of expository lectures by scientists from National Laboratories like PRL, AIIMS, as well as University professors aimed at providing Interdisciplinary Perspectives in Research to the undergraduate students. The DST PURSE programme has supported around 30 undergraduate students from all over Gujarat for the said conference.
(No. of expository talks: 5; No. of participants: 50)

(b) Interdisciplinary Perspective: Defense Studies, Earth System Science and Bio-Medical Science (IPDEB) held on 15th to 17th November 2013.

This was a research conference involving scientists in respective fields from Institutes like ICT Mumbai, AIIMS, PRL, ISRO, ARDE Pune, HEMRL Pune, MS University Vadodara, ISR Gandhinagar. The proceedings consisted of invited research talks as well as paper presentations. The main objective was to provide a platform for initiation of interdisciplinary studies and research.
(No. of invited speakers: 20; No.of participants: 60) **Please see enclosed Book of Abstracts for details.**

(3) As a follow-up of an MOU signed at National Education Summit 2014 at Gandhinagar among University of Turku, Finland, ToolTec Industries India and SPU, Prof. K Vaananen, Hon. Vice Chancellor of the University of Turku visited CISST on 12th December 2013 for the spot visit for the proposed **Centre of Biotechnology for Affordable Health Care**, to be established at CISST.

(4) Regular in House Research Presentations

The CISST arranges regular in house research presentation by research personnels at the center presenting the work in progress. Accordingly the following two presentations have been arranged at CISST during 2013-14.

- In-House Research Presentation August 2013
- In-House Research Presentation March 2014

(5) M.Sc(Applied) Science Programme Initiated

The University has initiated at CISST, with **its own resources** M.Sc. Applied Science Program (**Please see Annexure IV Page Nos. 60-101, for the updated course structure and syllabi content**) with specialization in each of the following:

a) Biomedical Science and Technology
b) Defence Science and Technology
c) Earth System Sciences

The CISST also designed and submitted proposals for financial assistance to this program to the Govt. of Gujarat under Innovative Program. The University has also alloted, since 2014, the following program to CISST.

d) M.Sc in Bioinformatics

The unique features of the M.Sc Applied Science Program at CISST include collaborative teaching by professors from different basic science departments of University as well as by research scientists from Institutes like PRL, Ahmedabad, ISRO, Ahmedabad and M.S. University, Vadodara.This further includes components like Research Projects, Seminar Presentations, Innovative Mathematics and Statistics Laboratory Courses as well as self study components.

(6) Collabrative Research

As a result of DST-PURSE Programme, CISST has facilitated collaborative research involving collaborators from different disciplines as follows:

a) Physics & Chemistry: Synthesis and X-Ray crystallographic Investigations of Heterocyclic compounds
b) Mathematics & Bioscience: Fractality and Allometry in some biological system and processes
c) Pharmaceutical Science & Medicine: Clinical Investigation of Hydrogel loaded with Methotrexate for treatment of Psoriasis
d) Pharmaceutical Science & Chemistry: Comparative study of Topically applied Hydrogels and Organogels in drug delivery
e) Chemistry & Biosciences : Chitosan Hydrogel Preparation, Characterization and evalution for drug based formulations
f) Bioscience & Computer Science: Bioinformatics
g) Mathematics & Finance: Fractal analysis in financial market

(7) Visitors to CISST during 2013-14

a) Prof. Dr. E. Arunan, IISc Banglore
b) Prof. Dr. R. N. Singh, CSIR-NGRI, Hyderabad
c) Prof. R. Deshpande, PRL, Ahmedabad.
d) Prof. Puneet Kaur, AIIMS, New Delhi.
e) Prof. Shyam Lal, PRL, Ahmedabad
f) Prof (Dr) Manmohan Sarin, PRL, Ahmedabad
g) Prof. Dr. Ramchandran, PRL, Ahmedabad
h) Prof. (Retd) Dr. J. J. Shah
i) Prof. Dr. N. P. Bhatt, M. S. Uni. of Baroda, Vadodara

(8) Central Experimental Facility

(a) New Laboratory established

A new **Cell Culture laboratory** has been established at CISST during 2013-14 installing the following equipments:

i) Fluorescence Micro-Plate reader
ii) CO_2 Incubator
iii) Class II biosafety Cabinets
iv) Inverted Fluorescence Phase Contrast Research Microscope.
v) Cold storage (-80^0C)

(b) Central Experimental facilities strengthened

The following new Scientific Equipments were added during 2013-14

i) Complete DC, I-V, C-V, Semiconductor Characterization System
ii) High performance Particle Size Analyzer with Zeta potential Measuring System
iii) Isothermal Titraton Calorimeter
iv) Size Exclusion Chromatograph

(9) Sample Analysis Service Provided

(I) Within the University: During the year of 2013-14 the following number of samples from Basic Science Departments like Chemistry, Bioscience from the University have been analysed using respective equipments.

a) LC-MS about 358 samples
b) Rheometer about 951 samples
c) Spectrofluorophotometer about 250 samples

(II) Outside the University: During the year of 2013-14 samples analysis service has been provided by the CISST to the researchers from the following institutes.

a) Charusat: Charotar University of Science and Technology
b) M. S University of Baroda

(10) Achievements of personals at CISST

a) Mr. Harsh Oza, MSc. Student of Applied Science programme is selected for a summer research training programme at PRL Ahmedabad.
b) Dr. Sahaj Gandhi, Assistant Professor, has been awarded 1st prize in Poster Competition in UGC sponsored one day seminar on Condensed Matter Physics (CMP 2014).
c) Mr. Sagar Patel was awarded travel fellowship from DBT India and Ontario Institute for Cancer Research for attending conference on Bioinformatics at Chicago, USA and University of Ontario, Toranto Canada.
d) Dr. Subhash Bhatt has been awarded Prof. A.R. Rao Research Award by Prof. A.R. Rao Foundation in December 2013.

(11) Research presentation by DST-PURSE/CISST personals in Conferences during 2013-14.

Sr. No.	Name	Title	Conference	Date
1.	Dr. Purvesh Bharvad	Plant products as Antimicrobial Agents	IPDEB	15th-17th Nov, 2013
2.	Dr. Pinaki Patel	Effect of Chemotherapeutic drug and phytochemical on growth of *S. pombe* cells.	IPDEB	15th-17th Nov, 2013
3.	Dr. Deep Shah & Ms. Mili Vyas	Chitosan Hydrogels: Preparation, Characterization and Evaluation for drug based Formulations.	IPDEB	15th-17th Nov, 2013
4.	Soumya Menon	Nutraceutical Properties and enzyme activity profiles of Yellow fleshed watermelon fruit during its development and ripening	National Conference of Plant Physiology, Junagadh Agricultural University, Junagadh, Gujarat	13th-15th Dec, 2013
		Biochemical attributes based nutritional quality evaluation of watermelon fruit at its different stages development and ripening	IPDEB	15th-17th Nov, 2013
5.	Megha Vaidya	*In-Silico* analysis of unknown pathogenic proteins of *Helicobacter pylori*	IPDEB	15th-17th Nov, 2013

6.	Pradeep Mackwan	Amphiphilc ionic liquid Hydrotope Mixtures: Preparation of ionic hydrogels with potential agents for drug carrying and release systems	IPDEB	15th-17th Nov, 2013
7.	Bhavesh Patel	Cyclodextrins: A novel miniature vesicle to enhance the Solubility and Bioavailability of Sparingly Soluble Drugs- A mini review and Future Perspectives	IPDEB	15th-17th Nov, 2013
8.	Disha Patel	Purification and Kinetic characterization of lipoxygenas isomer from *L.theobromae*	3rd International Science Congress, Karunya University, Coimbtour, Tamil Nadu	8th–9th Dec, 2013
9.	Gulshan Patel	Model based process monitoring and control for artifial ripening of the *Mangifera indica* (L.) [Mango] focusing on concentration of ethylene-a mini review and future perspectives	IPDEB	15th-17th Nov, 2013
10.	Hetul Suthar	Smart & Self-Responsive system based on Programmable Logical Controller and Android for efficient Agricultural Practices.	IPDEB	15th-17th Nov, 2013
11.	Jignesh Panchal	Semiconductor Vapour Sensor to Detect Explosives	IPDEB	15th-17th Nov, 2013
12.	Krutika Bhole	An in vitro study on antihypertensive activity and antioxidant potentials of *Averrhoea carambole* and *Manilkara zapota* extracts	IPDEB	15th-17th Nov, 2013
		Inhibitory activity of *Ziziphus jujube* and *Pyrus communis* fruit extracts and their antioxidant potential	3rd International Science Congress, Karunya University, Coimbtour, Tamil Nadu	8th–9th Dec, 2013
13.	Nilanjana Baraiya	Combined effect of hot water treatment and chemical elicitors in improving post harvest quality and shelf life of Jamun fruit (*Syzgium cumini* L.)	3rd International Science Congress, Karunya University, Coimbtour, Tamil Nadu	8th–9th Dec, 2013
		Improving Jamun fruit (*Syzgium cumini* L.) quality and post harvest storability by zein coating enriched with antioxidants.	International conference on Plant Biochemistry and Biotechnology in Food and Nutritional Security and XII Convention of Indian Society of Agricultural Biochemists, Kanpur	11th–14th Dec, 2013

14.	Pinal Vyas	Post harvest decay control and improvement of Nutritional quality of Cape gooseberry (*Physalis peruviana* L.) fruit using coating of xanthan gum, guar gum and their combinations with olive oil.	3rd International Science Congress, Karunya University, Coimbtour, Tamil Nadu	8th–9th Dec, 2013
		Storage behavior of Phalsa (*Grewia asiatica* L.) fruit affected by post harvest application of chemical treatment and storage conditions,	International conference on Plant Biochemistry and Biotechnology in Food and Nutritional Security and XII Convention of Indian Society of Agricultural Biochemists, Kanpur	11th–14th Dec, 2013
		Improvement of Post harvest quality and shelf life of custard Apple (*Annona squamosa* L.) fruit by using chitosan coating enriched with antibrowning and antimicrobial compounds.	IPDEB	15th-17th Nov, 2013
15.	Sagar Patel	Evolutionary study of some species belonging to Leguminosae family based on rbcL gene	International Conference on Functional and comparative Genomics and Pharmacogenomics, Chicago, USA	12th – 14th November 2013
		De Novo Transcriptome Analysis of *Arachis Hypogaea* L.	The seventh international Biocuration Conference (ISB2014), Toranto, Cannada.	6th -9th April, 2013
		Homology modeling of few conserved amino acid sequences in Leguminosae family	Great Lakes bioinformatics Conference 2014, Cincinnati, USA	16th-18th May, 2014
16.	Sonu Sharma	Impact of UV-C irradiation on health promoting compounds and sensory attributes of fresh-cut pinapple (*Ananas comosus* L.)	7th Annual convention of ABAP and Plant Biotechnology, Molecular Medicine and Human Health, University of Delhi, South Campus, Department of Genetics, New Delhi.	18th-20th October,2013
		In vitro analysis of antioxidant and antibacterial potential of Peels of Pear (*Pyrus communis* L.) fruits	IPDEB	15th-17th Nov, 2013

		Edible coating emulsions mediated improvement of Nutritional quality and safety of fresh-cut pinapple (*Ananas comosus* L.)	3rd International Science Congress, Karunya University, Coimbtour, Tamil Nadu	8th–9th Dec, 2013
		Effect of storage, temperatures and minimal processing on the antioxidant and sensory properties of four mango cultivars	International conference on Plant Biochemistry and Biotechnology in Food and Nutritional Security and XII Convention of Indian Society of Agricultural Biochemists, Kanpur	11th–14th Dec, 2013
17.	Dr. Rupal Vasant	Role of Multigrain diet on lipid metabolism in Hypercholesterolemic Albino rats.	IPDEB	15th-17th Nov, 2013
18.	Dr. Rakesh Patel	Thermal studies of carbon/ceramic composities	IPDEB	15th-17th Nov, 2013

13 c. Did newly created facility lead to betterment of quality of research publications?

Yes certainly it led and would lead.

13 d. Any patent filed by the University as a result of PURSE grant.

No

14. Is any problem faced in utilization of the grant/facilities?

No

15. A report highlighting the research activities of the University using facilities crated under PURSE Initiative during the period under review may also be provided:

Please see **Annexure – III** for details **(Page Nos. 53 to 59)**

(Prof. Dr. N. V. Sastry)
Nodal Officer, PURSE-DST Program

(Prof. Dr. Harish Padh)
Vice Chancellor
Coorodinator
PURSE-DST Program

Annexure – I

[A] Papers published in Academic Journals during April 2013- March 2014 Basic Science Departments:

Department of Biosciences

1. Singh N. K. Hasan S.S. Kumar J., Raj I., Pathan A.A., Parmar A., Shakil S., Gourinath S. Madamwar D. Crystal structure and interaction of phycocyanin with β-secreatase: A putative therapy for a Alzheimer's diseases. CNS & Neurological Disorders: Drug Target (In Press) (2014).
2. Yachana Jha, Gaurav Sablok, Naidu Subbarao, Raja Sudhakar, MHU Turabe Fazil, R B Subramanian, Andrea Squartini, Sunil Kumar. Bacterial-induced expression of RAB18 protein in Orzya sativa salinity stress and insights into molecular interaction with GTP ligand (In Press)(2014).
3. Sanjay S. Karn, Sanjay B. Pandavadara, Rupal A. Vasant, A. V. R. L. Narasimhacharya. Lovastatin improves fluoride induced hypercholesterolemia in albino rats. Fluoride (In Press) (2014).
4. Anjali Bose Shabnam Pathan, Khyati Pathak, Haresh Keharia. Keratinolytic protease production by Bacillus amyloliquefaciens 6B using feather meal as substrate and application of feather hydrolysate as organic nitrogen input for agricultural soil. Waste and Biomass Valorization (In Press) (2014).
5. Khyati V. Pathak, Haresh Keharia. Identification of surfactins and iturins produced by potent fungal antagonist,Bacillus subtilis K1 isolated from aerial roots of banyan (*Ficus benghalensis*) tree using mass spectrometry. 3 Biotech (In Press) (2014).
6. Khyati V Pathak, Anjali Bose, Haresh Keharia. Characterization of novel Lipopeptides produced by Bacillus tequilensis P15 using liquid chromatography coupled electron spray ionization tandem mass spectrometry (LC–ESI–MS/MS). International Journal of Peptide Research and Therapeutics (In Press) (2014).
7. Anjali Bose, Khyati Pathak, Haresh Keharia. Identification and characterization of novel surfactins produced by fungal antagonist Bacillus amyloliquefaciens 6B. Biotechnology and Applied Biochemistry (In press) (2014).
8. B. Kavita, Haresh Keharia. Anthraquinone 2-sulphonic mediated reduction of Cr(VI) by Bacillus sp. BT1. Desalination and Water Treatment (In Press) (2014).
9. Anjali Bose, Haresh Keharia. Phorbol ester degradation in Jatropha seedcake using white rot fungi. 3 Biotech (In Press) (2014).
10. Narra M., Dixit G., Divecha J., Kumar K., Madamwar D., Shah A. Production, purification and characterization of a novel GH 12 family endoglucanase from Aspergillus terreus and its application in enzymatic degradation of dignified rice straw. International Biodeterioration and Biodegradation, 88: 150-161 (2014).
11. Narra M., Balasubramanian V., Mehta H., Dixit G., Madamwar D., Shah A. Performance evaluation of aerobic hybrid reactors with different packing media for treating wastewater of mild alkali treated rice straw in ethanol fermentation process. Bioresource Technology, 152: 59-65 (2014).
12. Anwer K., Parmar A., Rahman S., Kaushal A., Madamwar D. Islam A., Hassan M.I., Ahmad F. Folding and stability studies on C-PE and its natural N- terminal truncant. Archives of Biochemistry and Biophysics, 545: 9-21 (2014).

13. Patel V., Munot H., Shouche Y.S. and Madamwar D. Response of bacterial community structure to seasonal fluctuation and anthropogenic pollution on costal water of Alang-Sosiya ship breaking yard, Bhavnagar, India. Bioresource Technology, 161, 362-370 (2014).

14. Kalia K, Chiragini H M, Sood P P. In vivo Antioxidative Effect of Bamboo (Bambusa arundinacea), Leaves Extract on Arsenic Induced Hepatic Oxidative Stress. Journal of Cell and Tissue Research, 14 (1): 4009-4017 (2014).

15. Rupal A. Vasant, Elizabeth R.C. Vincent, Sanjay S. Karn, Narasimhacharya V.R.L. Amaravadi. Multigrain diet mitigates fluoride induced metabolic toxicity. Journal of Environmental and Occupational Sciences, 3 (1): 25-30 (2014).

16. Vimal S. Prajapati, Nidhi Soni, Ujjval B. Trivedi, Kamlesh C. Patel. An enhancement of red pigment production by submerged culture of Monascus purpureus MTCC 410 employing statistical methodology. Biocatalysis and Agricultural Biotechnology, 3: 140-145 (2014).

17. Vimal S. Prajapati, U. B. Trivedi, K. C. Patel. Kinetic and thermodynamic characterization of glucoamylase from Colletotrichum sp. KCP1. Indian Journal of Microbiology, 54: 87-93 (2014).

18. Vimal S. Prajapati, Nidhi Soni, Ujjval B. Trivedi, Kamlesh C. Patel. An enhancement of red pigment production by submerged culture of Monascus purpureus MTCC 410 employing statistical methodology. Biocatalysis and Agricultural Biotechnology, 3: 140-145 (2014).

19. Soumya V. and T. V. Ramana Rao. Health promoting and related enzyme activities of muskmelon fruit during its development and ripening. Journal of Food Biochemistry, DOI: 10.1111/jfbc.12068 (2014).

20. Nilanjana S. Baraiya, T.V. Ramana Rao, V. R. Thakkar. Enhancement of storability and quality maintenance of carambola (Averrhoa carmbola L.) fruit by using composite edible coating. Fruits, 69 (3): xx- xx (2014).

21. Neeta B. Gol, T. V. Ramana Rao. Impact of zein and gelatin coatings on the postharvest quality maintenance and shelf life extension of mango (*Mangifera indica* L.) Fruits, 69: 1-15 (2014).

22. Soumya V., T. V. Ramana Rao. Nutritional Quality evaluation of four icebox cultivar of watermelon fruit during their development and ripening. International Food Research Journal, 21 (2): 631-639 (2014).

23. Prakash R. Patel, T. V. Ramana Rao. Growth and ripening in Blackplum [*Syzygium cumini* (L.) Skills] International Journal of Fruit Science, 14 (2): 147-156 (2014).

24. Pinal B. Vyas, Neeta B. Gol, T. V. Ramana Rao. Postharvest quality maintenance of papaya fruit by using polysaccharide based edible coatings. International Journal of Fruit Science, 14 (1): 81-94 (2014).

25. Rita Mahapatra, Siva Satya Mohan Jampala and Dhananjay Patel. 2014. Induction of systemic acquired resistance in Zea mays L. by Aspergillus flavus and A. parasiticus derived elicitors. Archives of Phytopathology and Plant Protection, DOI: 10.1080/03235408.2014.884523 (2014).

26. Pinaki B. Patel, Vasudev Thakkar. L-Carvone induces p53, Caspase 3 mediated apoptosis and inhibits the migration of breast cancer cell lines. Nutrition and Cancer, 66 (3): 453-462(2014).

27. Chavda Dhiraj, Bhatt Sujata. The histopathological and ultrastructural analysis of microsporidian infection in catla (*Catla catla*) and their effects on antioxidant enzymes

and protein expression. International Journal of Advanced Research, 2 (1): 608 – 624 (2014).

28. Khyati V. Pathak, Haresh Keharia. Application of extracellular lipopeptide biosurfactant produced by endophytic Bacillus subtilis K1 isolated from aerial roots of banyan (*Ficus benghalensis*) in microbially enhanced oil recovery (MEOR). 3-Biotech, 4: 41-48 (2014).

29. Anjali Bose, Vishal Chawdhary, Haresh Keharia, Ramalingam Bhagwathi Subramanian. Production and characterization of a solvent tolerant protease from a novel marine isolate Bacillus tequilensis P15. Annals of Microbiology, 64: 343-354 (2014).

30. Suthar, B., Pansuriya, J., Kher, M. M., Patel, V. R., Nataraj M. Biochemical changes under chromium stress on germinating seedlings of *Vigna radiata*. Notulae Scientia Biologicae, 6 (1): 77-81 (2014).

31. Parmar A., Singh N.K., Dhoke R. Madamwar D. Influence of light on phycobiliprotein production in three marine cyanobacterial cultures. Acta Physiologiae Plantarum, DOI: 10.1007/s11738-013-1219-8 (2013).

32. Matkar K., Chapla D., Divecha J., Nighojkar A., Madamwar D. Production of cellulase by a newly isolated strain of *Aspergillus sydowii* and its optimization under submerged fermentation. International Biodeterioration and Biodegradation, 78: 24-33 (2013).

33. Patel V., Madamwar D. Biodegradation of phenanthrene in bioaugmented microcosm by consortium ASP developed using coastal sediment of Alang-Sosiya ship breaking yard, Gujarat. Marine Pollution Bulletin, 74(1): 199-207 (2013).

34. Raghavendra T., Basak A., Manocha L. M., Shah A., Madamwar D. Robust nanobioconjugates of *Candida antarctica* lipase B – multiwalled carbon nanotubes: Characterization and application for multiple usages in non-aqueous biocatalysis. Bioresource Technology, 140: 103-110 (2013).

35. Shah V., Madamwar D. Community genomics: Isolation, characterization and expression of gene coding for azoreductase. International Biodeterioration & Biodegradation, 79: 1-8 (2013)

36. Shah V., Zakrzewski M., Wibberg D., Eikmeyer F., Schlüter A., Madamwar D. Taxonomic profiling and metagenome analysis of a microbial community from a habitat contaminated with industrial discharges. Microbial Ecology, 66: 533-550 (2013).

37. Oturkar C. C., Patole M.S., Gawai K. R., Madamwar D. Enzyme based cleavage strategy of Bacillus lentus BI377 in response to metabolism of azoic recalcitrant. Bioresource Technology, 130: 360-365 (2013).

38. Oturkar C.C., Othman M.A., Kulkarni M.J., Madamwar D., Gawai K.R. Synergestic action of flavin containing NADH dependant azoreductase and cytochrome P450 monoxygenase in azoaromatic mineralization. RSC Advances, 3: 3062-3070 (2013).

39. Anwer K., Sonani R., Madamwar D., Singh P., Khan F., Bisetty K., Ahmed F., Hassan Mf. I. Role of N-terminal residues on residues on folding and stability of C-phycoerythrin: simulation and urea-induced denaturation studies. Journal of Biomolecular Science and Dynamics, DOI: 10.1080/07391102.2013.855144 (2013).

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41. Kalia K, Chiragini H M, Sood P P. Effect of Antioxidants (Alpha-Lipoic Acid and Bamboo Shoot Extract, either alone or in combination), in Lead Induced Oxidative Stressed Animals. Journal of Cell and Tissue Research, 13 (1): 3431-3438 (2013).

42. Hitesh Patel, Kalia K. Polymorphisms in Mn-SOD and EC-SOD gene and risk of nephropathy in Western Indian type 2 diabetic patients. International Journal of Diabetes in Developing Countries, 33 (4): 229-235 (2013).

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49. Umang Bharucha, K. Patel and U. B. Trivedi. Optimization of indole acetic acid production by Pseudomonas putida UB1 and its effect as plant growth-promoting rhizobacteria on mustard (*Brassica nigra*). Agricultural Research, 2(3):215-221 (2013).

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54. Neeta B. Gol, Manu L. Chaudhari, T. V. Ramana Rao. Effect of edible coating on quality and shelf-life of carambola (Averrhoa carambola L.) fruit during storage. Journal of Food Science and Technology, DOI: 10.1007/s13197-013-0988-9 (2013).

55. Soumya V. Menon, T. V. Ramana Rao. Nutritional quality evaluation of nonnetted muskmelon fruit during its development and ripening Nutrition and Food Science, 43 (4): 398-406 (2013).

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57. Payal T. Shah and T. V. Ramana Rao. Physiological, biochemical and cellular changes associated with the ripening of bitter less bitter gourd (*Momordica dioica* Roxb. Ex Wild.) Fruits. The International Journal of Engineering and Science, 2(7): 1-5 (2013).

58. Bhaumik R Dave, Ankit P Sudhir, Pritesh Parmar, Saurabh Pathak, Dharmesh P Raykundaliya, R B Subramanian. Enhancement of Cellulase Activity from a New Strain of Thermoascus aurantiacus by Response Surface Methodology. Biocatalysis and Agricultural Biotechnology, 2: 108-115 (2013)

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61. Pritesh Parmar, Ankit Sudhir, Preethi R, Bhaumik Dave, Ketankumar Panchal, R. B. Subramanian, A. D. Patel, K. B. Kathiria. Identification of a SSR marker (TOM-144) linked to Fusarium wilt resistance in Solanum lycopersicum. American Journal of Molecular Biology, 3: 241-247 (2013)

62. Pritesh Parmar, Bhaumik Dave, Ketan Panchal, R. B. Subramanian. Identification of potential species Croton bonplandium, Sedges and Balanitis aegyptiaca for the application of phytoremediation American Journal of Plant Sciences, 4: 1246-1251 (2013).

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64. Yachana Jha, R. B. Subramanian. Characterization of root associated bacteria from Paddy and its growth promotion efficacy.3 Biotech, 4: 325-330 (2013).

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66. Jajda H.M., Patel R. R., Thakkar V.R. Purification and Identification of Aspergillus niger induced novel protein from groundnut (*Arachis hypogeae* L.). Journal of Cell and Tissue Research, 13 (1): 3485-3490 (2013).

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71. Anjali Bose, Haresh Keharia, M. P. Deshpande. Eco-Friendly photosynthesis of silver nanoparticles using Jatropha seedcake extract. Chinese Physics Letters, 30 (12): 128103 (2013).

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Department of Chemistry

73. Jignesh H. Trivedi, T. A. Bhatt, H. C. Trivedi. Synthesis and Characterization of Poly(butyl methacrylate) grafted sodium salt of partially carboxymethylated guar gum. Cellulose Chemistry and Technology (In Press) (2014)

74. Y. S. Patel., H. S. Patel. Studies on Coordination Polymers Derived from 2, 5-Bis (naphthalene-1-ylcarbamoyl) terephthalic acid. Journal of Macromolecular Science Part A, 51 (2): 134-143 (2014).

75. Y. S. Patel., H. S. Patel. Biological evaluation and spectral studies of asymmetrical 3, 5-disubtituted-1, 2, 4-Oxadiazoles. International Research Journal of Pure and Applied Chemistry, 4 (3): 315-326 (2014).

76. Hemali B. Lad, Rakesh R. Giri, Chirag V. Patel, Varun G. Bhila, D. I. Brahmbhatt. Microwave assisted preparation of new dicoumarinyl pyrazoline derivatives as antimicrobials, Current Microwave Chemistry, 1 (1): 64-74 (2014).

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79. Piyush N. Kalaria, Shailesh P. Satasia, Dipak K. Raval. Synthesis, identification and *in vitro* biological evaluation some novel 5-imidazopyrazole incorporated pyrazoline and isoxazoline derivatives. New Journal of Chemistry, DOI: 10.1039/C4NJ00244J (2014).

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Department of Physics

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[B] Books/Chapters in Book

Department of Bio-Sciences

1. Mohana S., Acharya B.K. and Madamwar D. (2013). Bioremediation concepts for treatment of distillery effluent in Biotechnology of environment management and resource recovery. Chapter 14. Editor: Ramesh Chandra Kuhad, Springer India.
2. S. M. Khasim, T.V. Ramana Rao, G. Ramesh and S. Hemalatha Structure and development of fruit and seed of *Jatropha gossypifolia* L**.** In B. Bahadur et al. (eds.), *Jatropha, Challenges for a New Energy Crop: Volume 2: Genetic Improvement and Biotechnology*, © Springer Science + Business Media New York 2013.

Department of Homescience

3. Roghelia, V and Patel, V.H. Chapter: Is Organically Grown food Safer and Nutridencse???, In Pragati: Compilation of researches in Home Science, Lajja Publications, Vallabh Vidyanagar. (2013)
4. Chauhan, M, Patel, V.H. and Rema, S. Chapter: Role of Dietary Components and Physical Exercise in Reducing the Risk of Osteoporosis, In Pragati: Compilation of researches in Home Science, Lajja Publications, Vallabh Vidyanagar. (2013)
5. Vadwala, Y. and Kola, N. Chapter: Application of Natural Dye Extracted from Waste Leaves of Terminalia Catappa (Tropical Almond) on Pre-treated Cotton Fabric, In Pragati: Compilation of Researches in Home Science, Lajja Publications, Vallabh Vidyanagar. (2013)
6. Vadwala, Y. and Kola, N. Chapter: Utilization of Waste Leaves of Tropical Almond (Terminilia Catappa) for Block Printing of Cotton, In Pragati: Compilation of Researches in

Home Science, Lajja Publications, Vallabh Vidyanagar. (2013)

7. Rupareliya, M. and Kola, N. Chapter: Improving Physical Properties of Wool by Silicone Finishes, In Pragati: Compilation of Researches in Home Science, Lajja Publications, Vallabh Vidyanagar. (2013)

Department of Computer Sciences

8. Birajkumar Patel and Dipti Shah, "Meta-Search Engine Optimization", ISBN-13: 978-3-659-12893-6, LAP LAMBERT Academic Publishing. (February, 2014).
9. Hardik Pandit and Dipti Shah "Image Processing & Analysis for Medical palmistry", ISBN-13: 978-3-659-12268-2, LAP LAMBERT Academic Publishing (February, 2014).
10. Shah, S.M., Sajja, P.S. and Smart, J.V. "Computer studies", Gujarat State Board of School Textbooks, Gandhinagar, Gujarat, India (June, 2013)
11. Sajja, P.S. and Akerkar, R.A. "Bio-inspired models and the semantic web", in Xin-She Yang, Zhihua Cui, Renbin Xiao, Amir Hossein Gandomi and Mehmet Karamanoglu (Eds.), Swarm Intelligence and Bio-Inspired Computation: Theory and Applications, Chapter 12, pp.273-294, Elsevier, Waltham, MA, USA (June, 2013)
12. Computer Studies (Standard 9) (as co-author), Gujarat State Board of School Textbooks, Gandhinagar – 382 010, Gujarat, India (June, 2013)

Annexure – II

Details of Sponsored Research Projects during April 2013- March 2014 Science Departments

[A] List of Ongoing Projects

Department of Biosciences

1. Prof. Datta Madamwar (P.I.) Metagenome analysis for metabolic pathways present in activated biomass at common effluent treatment plant (CETP) , DBT New Delhi, Rs. 61,32,000/- (2010-2013) **(Completed)**
2. Prof. Datta Madamwar (P.I.) Application of periodic discontinuous batch operation to enhance treatment efficiency of dye containing waste-water, DBT New Delhi, Rs. 51,02,000/-(2010-2013) **(Completed)**
3. Prof. Datta Madamwar (P.I.) Molecular assessment of bacterial community structure of long term polluted sea coast near Alang ship breaking yard and exploitation of the bacterial wealth for PAH bioremediation ,DST- New Delhi, Rs. 26,95,000/-(2010-2014)**(Ongoing)**
4. Prof. Datta Madamwar (Coordinator/P.I.), Prof. R. B. Subramanian (P.I.) , Dr. Hareshkumar Keharia (P.I.), Molecular and '-omics' technologies to gauge microbial communities and bioremediation of xenobiotic contaminated sites. DBT New Delhi, Rs. 3,07,73,000/-(2010-2015)**(Ongoing)**
5. Prof. Datta Madamwar (P.I.), Folding and stability of naturally truncated photosynthetic pigment, C-phycoerythrin from cyanobacteria *Phormidium tenue,* DST- New Delhi, Rs. 3,60,000/-(2012-2016)**(Ongoing)**
6. Prof. Datta Madamwar (P.I.), Molecular assessment of bacterial community structures of long term oil contaminated soil and screening of lipase producers for lipase production and their application in ester synthesis in organic solvents, UGC New Delhi, Rs. 13,55,800/-(2013-2016)**(Ongoing)**
7. Dr. Amita Shah (PI), Production of B- xylosidase and accessory hemicellulolytic enzymes for effective bioconversation of plant lignocelluloses, GSBTM Gandhinagar, Rs. 19,60,800/- (2011-2014)**(Ongoing)**
8. Dr. T.V. Ramna Rao in collaboration with Dr. Anil Nandane, Dept. of Food Processing Technolgy, ADIT, New Vallabh Vidyangar, Gujarat, Development and optimization of edible coating formulations to improve the postharvest quality and shelf-life of underutilized short lived fresh fruits by using RSM. MOFPI – Department of Science and Technology (SERB), New Delhi, Rs. 17,12,800/-(2012) **(Ongoing)**
9. Dr. Sujata S. Bhatt "An investigation into the development of alternative Carp feed using Prebiotics, Probiotics and fermentation, UGC Rs. 6,69,800/- **(Completed)**
10. Dr. K. C. Patel, Curdlan and Lipase production using *Cellulomonas flavigena* UNP3 and their application UGC Rs. 7, 57,800/-**(Ongoing)**
11. Dr. K. C. Patel, Dr. U. B. Trivedi, Production and characterization of a yellow antioxidant pigment from *Colletotrichum* sp. KCP1, DBt, Rs. 20,13,200/-**(Ongoing)**

12. Dr. M. Natraj PI, Micropropagation of *Hyphaene dichotoma*-a rare and endemic palm, UGC Rs. 9,28,300/-.**(Completed)**

Department of Chemistry

13. Dr.H.S.Patel, Decolorization and Removal of Dyes from Textile Industrial Effluents, UGC New Delhi, Rs. 8,64,300.00/- (2011-2014) **(Completed)**
14. Dr. N. V. Sastry, Nanoaggregates in Mixed Micellar Systems of Amphiphilic Copolymer and Conventional Ionic or Nonionic Surfactants – A Search for Synergistic Behaviour and Their Utility As Drug Solubilizing and Release Systems Based On Hydrogels, UGC New Delhi, Rs. 8,64,300.00/- (2011-2014) **(Completed)**
15. Dr. N. V. Sastry, Studies on Aggregation Behavior of Pyridinium based Amphiphilic Ionic Liquids in Water and in Presence of Aggregate Growth Promoters, UGC – DAE Consortium for Scientific Research, Mumbai Center, R-5 Shed, BARC, Mumbai, 4,17,000.00/- (2011-2014) **(Ongoing)**
16. Dr. M. N. Patel, Evolution of Metal Based Drugs as SOD Mimics and Artificial Metallonucleases, UGC, New Delhi, Rs. 10,67,800/- (2011-2014) **(Ongoing)**
17. Dr. M. N. Patel, UGC BSR "one time grant, UGC New Delhi, Rs. 7,00,000/- (2014 – 2015) **(Ongoing)**
18. Dr. M. P. Patel, Studies of new superabsorbent nanomaterials for removal of toxic metals and dyes from industrial waste water, UGC New Delhi, Rs. 7,00,800/- **(Ongoing)**
19. Dr. N. J. Parmar, Synthesis of Bioactive Polyheterocycles Via Knoevenagel-hetero-Diels–Alder reaction, UGC New Delhi, Rs. 7,38,800/- (2011-2014) **(Ongoing)**
20. Dr. S. S. SONI, Influence of Micellar Morphology on Conductivity of Polymer Gel Electrolytes, UGC-DAE, Mumbai centre, Mumbai, Rs. 5,92,000/- (April 2012 – March 2015) **(Ongoing)**
21. Dr. S. S. SONI, Development of porous functionalized metal oxides and their application in metal ion removal, UGC, New Delhi, Rs. 10,35,800/- (July 2012- June 2015) **(Ongoing)**
22. Dr. S. S. SONI, Development of Water based Polymer Gel Electrolytes for Advanced Devices, SERB, DST, New Delhi (DST Young Scientist Award) Rs. 25, 40, 800/- (April 2013-March 2016) **(Ongoing)**
23. Dr. J.H. Trivedi, Photo-Induced Synthesis, Characterization and Potential Applications of Sodium salt of Partially Carboxymethylated Sodium Alginate, University Grants Commission, New Delhi, Rs. 11,22,500/- **(Ongoing)**

Department of Home Science

24. Dr. V.H.Patel (PI), Development of Total Phenolic Compounds and Total Antioxidant Capacity of Indian Foods, UGC, Rs. 10,65,800/- 1 year (April 2013 to March 2014) **(Completed)**
25. Dr. Rema Subhash (PI), Immobilisation of probiotic microorganisms on food matrics and their efficacy in the preparation of fermented dairy products, DBT, New Delhi, Rs. 11,37,200/- 1 year (April 2013 to March 2014) **(Completed)**

Department of Statistics

26. Dr. M.B.Bhatt (PI), Inferential problems on Non-regular (Truncation parameter) family of distributions, UGC, Rs. Rs. 11,95,800/- 3 year (April 2013 to March 2016) **(Ongoing)**

Department of Physics

27. Prof. M. P. Deshpande (PI), Synthesis and Characterization of V2- VI3 Compound in single crystal/nanomaterial/thin film forms, UGC New Delhi, Rs. 11,16,800/- 3years. (April 2013 to March 2016). **(Ongoing)**
28. Dr. N. K. Bhatt (PI)/ Prof A. R. Jani (CI), Vibrational response and phase transition in certain non simple metals and alloys covering wide range of destinies, UGC New Delhi, Rs. 9,76,800/-, 3years. **(Ongoing)**
29. Prof. P. C. Vinodkumar (PI), Study of strong and weak decay processes of mesons involving heavy flavor quarks, UGC, Rs. 9,00,400/- 3 years (July 2011 to June 2014). **(Ongoing)**
30. Prof. M. P. Deshpande (PI), Raman Spectroscopy and Resistivity studies of semiconductors under pressure. DAE-BRNS , Rs. 24,61,250/- 3 years (2012-2013). **(Completed)**
31. Prof. U.H. Patel (PI) and Dr. Saurabh S. Soni, Synthesis and Single crystal X-ray Characterization of catalytically active Ionic Crystal, DST-PURSE SPU. Rs. 1,00,000/- one year (2012-2013) **(Completed)**
32. Prof. S. H. Chaki and Prof. M.P. Deshpande, Synthesis and Charcterization of Tin monosulphide thin films, nanoparticles and single crystals for optoelectronic devices, DAE-BRNS, Rs. 24,49,000/- 3 years (2010-2013). **(Completed)**
33. Prof. G. K. Solanki (PI) Studies on well characterized doped crystals of GeSe and SnSe for their applications in optoelectronic devices. UGC New Delhi, Rs. 4,95,000/- 3 years (2011-2014). **(Ongoing)**
34. Prof. S. H. chaki (PI), Preparation and characterization of Cu2S(x=1 to 2) in nanocrystalline thin films, nanoparticles and single crystal forms for optoelectronic devices, UGC New Delhi, Rs. 10,85,542/-, 3 years. **(Ongoing)**

Department of Material Science

35. Prof. L. M. Manocha (PI), Development of Silver based polymeric matrix nanocomposites, UGC New Delhi, Rs. 8,58,000/- 3years (2011-2014) **(Ongoing)**
36. Prof. L. M. Manocha (PI), MoU for Scientific International Collaborations. Collaboration with Shinshu University, Japan; Argon National Laboratory, Chicago, USA; and Seoul National University of Science and Technology; Korea, UGC New Delhi, Rs. 2,50,000/- (Upto 2014) **(Ongoing)**
37. Prof. L. M. Manocha (PI), Studies on effect of Irradiation on Physical and Mechanical Properties of Densified Carbon and SiC based Composites, IPR-BRFST, Rs. 19,78,000/- 2 years **(Ongoing)**
38. Dr. (Ms) R. H. Patel (PI), Studies on flame retardant polymer coatings based on Polyester Urethane-Epoxy Resin Systems, UGC- New Delhi, Rs. 6,96,000/-, (2011 to 2014) **(Ongoing)**
39. Prof. L. M. Manocha (PI), Centre of Advance studies, UGC, Rs. 106 lakhs, (2009 to 2014) **(Ongoing)**

Department of Electronics

40. Dr. (Ms) Basumati H. Patel (PI), Synthesis and Characterization of pulsed laser deposited semiconductor thin films for nanosensor application, UGC,-New Delhi, Rs. 14,58,800/- (2012-2015) **(Ongoing)**
41. Dr. (Ms) Vibha S. Vaishnav (PI), Interdisciplinary Research work on development of gas/vapour sensors using the oxide semiconductor with possible extended study of the response of Tin metal to mechanical and electrical stimuli, DST-PURSE Programme, Sardar Patel University, Rs. 1,00,000/- (2013-2014) **(Completed)**

[B] Details of Major Funding (eg., SAP/CAS/FIST/ Innovative Program etc.,)

Department of Biosciences

1. DST-FIST PROGRAMME (2009 - 2014); Sanctioned amount: Rs.71,00,000/-

Department of Chemistry

2. UGC-CAS Program, Rs. 1.0 crore
3. DST-FIST Program, Rs. 38.0 lakhs

Department of Home Science

4. UGC Innovative Program

   The P.G. Department of Home Science received Rs. 58 lakhs under UGC Innovative Program in the year 2010. The period of the project is from 2010 to 2015. Under this program the Department initiated a new course P.G. Diploma in Nutrigenomics and currently also offers specialization program in Nutrigenomics under M.Sc Foods and Nutrition (grant in aid) and M.Sc. Food Biotechnology (self finance).

   Under the project the department got:

   i. Equipment grant : Rs. 30,00,000
   ii. Non recurring grant: Rs. 28,00,000
   iii. Staff: One post of Assistant Professor

   The research areas identified under the program were:

   i. Effect of Antioxidants at gene expression levels in human, animal and yeast models.
   ii. Obesity

5. UGC-SAP-DRS-I

   The P.G.Department of Home science received Rs. 75 lakhs (non recurring Rs. 44 lakhs + recurring Rs. 31 lakhs) under SAP(DRS-I) approved on 14/12/2010 and sanctioned on 1/4/2013 for a period of five years i.e. upto 31/3/2015. The coordinator is Dr. Rema Subhash and Co-cordinator is Dr. V.H.Patel .

   The thrust areas of Research are:

   i. Field Studies in Community Health and Care
   ii. Development of functional Foods.

Department of Mathematics

6. The department is selected for UGC-SAP-DRS (Phase-II) for the period 01-04-2009 to 31-03-2014. The total grant sanctioned for the period is Rs. 59,75,000/-.

7. The departmental library is recognized as a Regional Library by the National Board for Higher Mathematics, Department of Atomic Energy, Government of India. The department receives an Annual Grant of Rs. 36,00,000/- for this. The total grant so far reaches to Rs. 4 crores.

Annexure – III

Research Activities of the University under PURSE – DST Programme during the period 2013-14 of Report

1. Thrust Areas of Research in the Science Departments

Department	Thrust Areas of Research
Department of Biosciences	Microbial and Environmental Biotechnology, Plant Morphogenesis and Physiology, Plant and Animal Biotechnology, Plant and Microbial Biodiversity, Phytochemistry and allied area, Histo-Physiology of Fruit Development and Ripening, Pre and Post Harvest Biology and Technology of Fruits and Vegetables
Department of Chemistry	Polymer Science (Polymer synthesis, modification and characterization, composites, solution properties, biodegradable polymers etc) , Organic Chemistry (Synthesis of bio-active heterocycles, photochromic dyes, medicinal chemistry etc) Inorganic Chemistry (Coordination chemistry and polymers), Physical Chemistry (Thermodynamics of Nonelectrolyte solutions, Ionic liquids) ,Theoritical Chemistry (Normal coordinate treatment & MO calculations of organic and inorganic molecules), Material Chemistry (Mesoporous Thin Films, Dye Sensitized Solar Cells)
Department of Computer Science	Simulation and Speech Recognition, Distributed Computing, Image Processing, Soft computing, Software Engineering, Search Engine Optimization, Speech Recognition.
Department of Electronics	Electronic / Semiconducting Materials and DevicesSensors & Transducers – Interfacing,Electroluminescent(EL) Display Devices,BioSensors & Bio Electronics,Polymer Electronics
Department of Home Science	Functional foods and Nutraceuticals (Antioxidant and Probiotics), Dietary intervention for specific health claim, Nutrigenomics, Bio-processing (fermentation and germination)., Molecular techniques for the detection of food pathogens, Natural Dyes, contemporary wear, traditional textiles, Posture Improvement, Better interiors, Entrepreneurship development, Environment protection and energy conservation, Consumer awareness and enhancement., Women empowerment.
Department of Materials Science	**Carbon/Carbon Composites**: Development of carbon/carbon composites with different types of reinforcements ranging from oxidized PAN fibers to high modulus PAN and pitch based carbon fibers; studies on development of matrix microstructure as influenced by fiber type, matrix precursor and heat treatment temperature; fiber/matrix interface; mechanical and thermal properties of composites; oxidation behavior; development of oxidation resistant carbon/carbon

	composites by in-situ matrix modification as well as through coatings. **Ceramic Matrix Composites**: Sol-gel processing of carbon/silicon carbide fiber reinforced silicon oxycarbide matrix composites, silicon carbide/silicon carbide composites, silica/silica composites; interphase analysis, matrix microstructure, mechanical properties, fracture behavior; development of carbon/ceramic particulate composites with and without fibers through self sinterable cokes; thermal properties of composites. **Sol-Gel Science**: Development of black glasses constituting ternary C, Si and O elements; oxynitrides; zircon and tantalum based solid and coating materials; freeze gellation and electrophoretic techniques. **Activated Carbon/Metal Impregnated Carbon**: Activated carbon from waste biomass, metal impregnated carbon and fiber reinforced composites for water purification, antibacterial activity. **Nanomaterials & Smart Materials**: Development of novel techniques for synthesis of carbon nanomaterials (nanofibers, nanotubes, nanocomposites etc.) with a view to enhance thermal and mechanical properties of the end products. Research and development of nanoclays and nanoclay based composites. Synthesis of nanoparticles (Silver, Hydroxyapatite) for biomedical applications. Fabrication of nanoporous carbons & nanostructured inorganic materials for energy applications.
Department of Mathematics	Banach and Topological Algebras, Operator Theory and Operator Algebras, Function Algebras and Function Species, Hormonic Analysis, Fincial Mathematics, Fractals and Applications,Relativity and Theories of Gravitation , Graph Theory, Mathematical Tribology.
Department of Physics	Crystal growth (different methods) and Characterization, Thin film preparation and device fabrication, Nano-particle studies, Photovoltaic and other Electronic Applications, X-ray crystallography of bio-molecules etc, High Pressure studies on crystals, Low Dimensional conductors, Theory of Condensed-Matter systems, Atomic and Molecular Collisions and electron impact ionization (Theory), Oceanographic and remote sensing data analysis and modeling (Collaboration with SAC-Isro Ahmedabad), Hadron Physics (Theory)
Department of Statistics	Statistical Inference, Design of Experiments, Survey Sampling Inference, Statistical Quality Control, Market research and Financial research, Statistics in Pharmaceutical Science, in Home Science, in Bio Sciences, in Engineering, and in Social Sciences.

2. Academic Achievements of Various Departments

[1] Details of Foreign visits by faculties of various departments

Department of Biosciences

1. Prof. Datta Madamwar visited Mauritius to deliverer an invited talk on "Biocatalyst Engineering for Improving Catalytic Performance in Non-aqueous System" in International Conference on 'Biotechnology for Better Tomorrow' at Rajiv Gandhi Science Centre, Mauritius during November 11-12, 2013.

Department of Chemistry

2. Dr. J. H. Trivedi: The research paper entitled "Synthesis, Characterization and Swelling Behaviour of Superabsorbent Hydrogel from Sodium salt of Partially Carboxymethylated Sodium Alginate-g-PAN" presented at the 4th Asian Symposium on Advanced Materials-Chemistry, Physics & Biomedicine of Functional and Novel Materials (ASAM-4) held at the National Taiwan University of Science and Technology, Taipei-10607, Taiwan during 22nd – 25th October,*2013*.

[2] Details of Fellowship/Awards to Research Students:

Department of Bioscience

1. Ms. Jenny Johnson was awarded DST-INSPIRE Fellowship, for securing First Rank in the University in the subject of Microbiology

2. Dr. T.V. Ramna Rao Young Scientist Award secured by Soumya V.and T.V. Ramana Rao Nutraceutical properties and enzyme activity profiles of yellow fleshed watermelon fruit during its ripening. National Conference of Plant Physiology – 2013 on Current Trends in Plant Biology Research held during 13th – 16th December, 2013, organized by Directorate of Groundnut Research, Junagadh and Indian Society for Plant Physiology, New Delhi, in association with Junagadh Agricultural University, Junagadh.

3. Best Oral Presentation Award secured by Sonu Sharma and T.V. Ramana Rao Edible coating emulsions mediated improvement of nutritional quality and safety of fresh-cut pineapple (Ananas comosus [L.] Merr.) 3rd International Science Congress organized by International Science Congress Association during 8th and 9th December, 2013, held in Karunya University, Karunya nagar, Coimbatore, Tamil-Nadu.

Department of Chemistry

4. 10 Research Students awarded to Fellowship under RFSMS Programe.

Department of Computer Science

5. Dr H B Pandit, Completed UGC Orientation course (28 days) at Academic Staff Collage, Vallabh Vidyanagar. Between 6th January, 2014 to 2nd February, 2014.

6. Ms J K Patel, Completed Orientation Programme at Academic Staff College – Sardar Patel University and Secured 'A' Grade.

7. Dr J A Trivedi, Completed Refresher Course in Computer Science at Academic Staff College – Sardar Patel University and Secured 'A' Grade. (From 16/12/2013 to 05/01/2014)

8. Ms. R D Gaharwar, Completed Orientation Programme at Academic Staff College – Sardar Patel University and Secured 'A' Grade.

Department of Homescience

9. One student awarded with Inspire fellowship for Research from DST (New Delhi)

10. Two students- Meritorious Fellowship

[3] Details of Ph.D degree awarded in the year 2013-2014:

Sr. No.	Name of the Student	Guide / Co-Guide	Title of Thesis
Department of Bioscience			
1.	Tripti Raghavandra	Dr. Amita Shah (Guide) Prof. Datta Madamwar (Co-Guide)	Study of microemulsion based organogels and multiwalled carbon nano tubes as potential supports for lipase immobilization and application in non-aqueous catalysis
2	Neeta B Gol	Prof. T.V. Ramna Rao	Postharvest quality maintenance and sheld life extension of some commercially important perishable horticultural commodities
3	Madhuri Narra	Dr. Amita Shah (Guide) Prof. Datta Madamwar (Co-Guide)	Microbial production, Purification and characterization of celluloses: Application in Bio el production
4	Vilas Patel	Dr. Datta Madamwar	*Taxonomic profiling of bacterial community structure from marine ecosystem of Alang- Sosiya ship breaking yard, Gujarat and exploitation of the bacterial wealth for PAH bioremediation*
5	Mrs. Rita Mahapatra	Dr. J.S.S. Mohan	Induction of systemic acquired resistance (SAR) in Zea mays L. (marge) by using different elicitors.
6	Ms. Shivani Patel	Dr. V. R. Thakkar (Guide) Dr. R. B. Subramanian (Co-Guide)	Marker assisted selection for high oil yielding varieties in Jatropha curcasl
7	Miss.K.D.Patel	Dr.H.S.Patel	Studies on co-ordination poly-mers based on novel bis-ligands
8	Miss.V.P.Modi	Dr.H.S.Patel	Studies on novel heterocyclic compounds
9	P.N.Patel	Dr.H.S.Patel	Studies on post heterocycliza- tion of 4,5,6,7-tetrahydrothieno [3,2-c]pyridine
10	Y.S.Patel	Dr.H.S.Patel	Studies on polymer derived from pyromellitic dianhydride
11	N.N.Patel	Dr.H.S.Patel	Studies on interacting blends of commercial unsaturated polye- sters and epoxy residue containing unsaturated poly(ester-amide)s

12	C.J.Patel	Dr.H.S.Patel	Studies on UV-curable PUA surface coating derived from soyafatty acid and epoxy ester
13	P.C.Panchal	Dr.H.S.Patel	Studies on UV-curable PUA surface coating formulated from coconut oil based Alkyd resin
14	V.J.Dave	Dr.H.S.Patel	Synthesis and characterization of IPN derived from modified castor oil based PU and different Acrylates
15	S.M.Jani	Dr.H.S.Patel	Synthesis and characterization of water born PU dispersion based on renewable resources.
16	B.M.Patel	Dr.H.S.Patel	Interacting Polyurethane blends of rosin modified Phenolic resin and castor oil with diisocyanate
17	Kinnar Rajendra Pandya	Dr. D. I. Brahmbhatt	Synthesis and antimicrobial study of some bipyridinyl/pyrazolyl pyrazoline substituted and pyrazolo/pyrrolo fused coumarins
18	Jigar Lalbhai Patel	Dr. D. I. Brahmbhatt	Synthesis, characterization and antimicrobial screening of some pyridyl/bipyridinyl substituted and pyrido/furo fused coumarins
19	Bhautik B. Thummar	Dr. D. K. Raval	Synergy of ionic liquid and non-conventional energy sources towards facile syntheses of diverse application oriented heterocyclic compounds using 5(4h)-pyrazolones
20	Devaji S. Patel	Dr. D. K. Raval	Green Protocols For Heterocyclic Synthesis Using Ionic Liquids [DBU][Ac] For Imidazo[1,2-a]quinolines and Chromenes PEG-DIL For Quinolones
21	Umesh P. Tarpada	Dr. D. K. Raval	Polymer supported sulphanilic acid: a green heterogeneous catalyst for synthesis of some heterocycles [benzimidazoles, benzoxazoles, quinoxalines and benzimidazole quinazolinones]
22	Jemin R. Avalani	Dr. D. K. Raval	Novel and efficient protocols for the synthesis of some heterocyclic motifs using various catalysts
23	H. N. Joshi	Dr. M. N. Patel	DNA interaction, antimicrobial and cytotoxic activities of copper(II), ruthenium(II) and ruthenium(III) complexes
24	C. R. Patel	Dr. M. N. Patel	Synthesis, characterization and biological activities of drug based square pyramidal copper(II) complexes and square planer platinum(II) complexes
25	Harshad G. Kathrotiya	Dr. Manish P. Patel	Synthesis and biological evaluation of new 2-phenyl indole and 2-aryloxyquinoline based heterocycles
26	Yatin N. Patel	Dr. Manish P. Patel	Studies of new ionic superabsorbent hydrogels for removal of dyes and heavy metals from aqueous solution
27	Hardik H. Jardosh	Dr. Manish P. Patel	Synthesis, Characterization and Biological Exploration of Diverse Heterocycles Library of N-allyl Quinolone
28	Bhavesh R. Pansuriya	Dr. N. J. Parmar	Synthesis Of Some Heterocycles Of Biological Interest *Via* Azomethine Ylide And Oxabutadiene Intermediates
29	Hitesh A. Barad	Dr. N. J. Parmar	Efficient Synthesis And Biological Screening Of Some Benzodiazepinones And Pyrano—Fused Heterocycles
30	Kinnari B. Trivedi	Dr. K. H. Patel	Studies in Graft copolymers from renewable resources
31	Ms. Deepali A. Kotadia	Dr. S. S. Soni	Development of Homogeneous and Heterogeneous Catalysts for Cross – coupling, biofuels, and industrially

			important reactions
Department of Computer Science			
32	Kamlesh Vaishnav	Dr. P V Virparia	An Integrated Approach to Improve Ontology Mapping Process in Semantic Web
33	Nehal Daulatjada	Dr. P V Virparia	Domain-Specific Ontology for Student's Information In Academic Institution
34	Sohil D Pandya	Dr. P V Virparia	Uncovering Knowledge Patterns using Data Mining Techniques from Databases in an Indian University
35	Jyoti Tiwari	Dr. D B Choksi	Harnessing Knowledge Management Through ICT
36	Biraj Patel	Dr. D B Shah	Model for Meta-Search Engine
37	Mijal Mistry	Dr. D B Shah	A Methodical Approach for Communication & Co-operation between agents using ontology for Healthcare
38	Hardik Pandit	Dr. D B Shah	Decision Support System for Healthcare on the basis of Medical Palmistry through Digital Image Processing and Analysis
39	Anita M Gutta	Priti Srinivas Sajja	A multi-agent framework for agricultural activities
40	Kunjal B Mankad	Priti Srinivas Sajja	A genetic-fuzzy approach to measure multiple intelligence
41	Sanskruti V Patel	Priti Srinivas Sajja	Development of multi-agent knowledge-based system accessing distributed database grid
Department of Homescience			
42	Sulaiman Ai-Baher	Dr. Manjari Acharya	An Ergonomic Investigation in the Interior Design of Living Room in the Residences of Hodaidah City
43	Ranjeet Kaur G. Shaikh	Dr. Manjari Acharya	An Ergnomic Assessment of Selected Activities Carried out in Food Units
Department of Material Science			
44	Kalpeshkumar Arvindbhai Patel	Prof.(Mrs) S. Manocha	Development and Characterization of Glassy carbon and silica derived foams using template route
45	Guddu Ramshanker Prasad	Prof. L M. Manocha	Studies on the development of carbon-ceramic particular/fiber reinforced composites and their friction and wear properties
Department of Mathematics			
46	Adnan Khalid mohammed Al-Salihi	Dr. A.H.Hasmani	Studt of similarity techniquesin differential equations and applications.
47	Nikhilkumar Devjibhai Abhangi	Dr. G. M. Deheri	Numerical methods of some problems related to lubrication in tribology.
48	Snehal Dineshchandra Shukla	Dr. G. M. Deheri	Rough bearing lubricated with magnetic fluid
49	Mukesh Eknath Shimpi	Dr. G. M. Deheri	Numerical models Associated with some problems in lubrications

Department of Physics			
50	Vishal Ratanchand Jain	Prof. A. T. Oza	Spectroscopic study of magnetic conductors, organic ferromagnets and their precursors
51	Keyurkumar Savdasbhai Hingarajiya	Dr. K. D. Patel	Growth and characterization of nano crystalline p-SnSe thin films for its use in p-SnSe/n-$MoSe_2$ heterojunction diode.
52	Manisha Pravinbhai Santoki	Prof. K. N. Joshipura	Data-assimilative ocean circulation model for studying Indian ocean dynamical features.
53	Pravinsinh Indrasinh Rathod	Prof. A. T. Oza	Spectroscopic study of charge transfer complexes of biomolecular solids
54	Kirankumar Keshavlal Patel	Dr. K. D. Patel	Studies on well characterized thermally evaporated SnSe thin films for Scottky barrier device application
55	Nitingiri Nareshgiri Gosai	Dr. G. K. Solanki	Synthesis and characterization of pure and Cu Doped SnSe nanoparticles
56	Siddhartkumar Harshadbhai Pandya	Prof. K. N. Joshipura	Electron scattering and atomic-molecular processes: theoretical studies and planetary applications
57	Arpitkumar Shaileshbhai Parmar	Prof. P.C. Vinodkumar	Decay properties of heavy flavor Hadrons
58	Brinda Bachulal Nariya	Prof. A.R. Jani	Growth and characterizations of single crystals in $Sn_xPb_{1-x}S$ series.
59	Sagarkumar Mansukhlal Agravat	Prof. A. T. Oza	Spectroscopic study of charge transfer complexes of organic and metal-organic photoconductors
60	Nitya Anilkumar Garg	Prof. M.P. Deshpande	Study on nanoparticles, thin films of CdSe Semiconductor prepared by bottom-up approach technique.
61	Yunus Gafur Mansur	Dr. G. K. Solanki	Synthesis if $GeSxSe_{1-x}$(X=0, 0.25, 0.5, 0.75, &1.0) crystals by chemical vapour transport technique and its characterization
62	Ruchita Ramanbhai Patel	Dr. G. K. Solanki	Synthesis and characterization of lead doped germanium monoselenide single crystals
63	Divyeshkumar Narendrakumar Bhavsar	Prof. A.R. Jani	Growth, characterizations and high pressure studies for certain single crystals of layered semiconductors
64	Dhirajbhai Bhavanibhai Shah	Prof. A.R. Jani	Thermal infrared remote sensing over land surface: retrival and application of land surface temperature
65	Kaushal Kishorchandra Thakkar	Prof. P.C. Vinodkumar	Static and Dyanamic properties of Baryons and Hypernuclei
Department of Statistics			
68	Mr.Nirmal R Jain	Prof.Ashok Shanubhogue	Some studies on non-regular families of distributions

SARDAR PATEL UNIVERSITY
VALLABH VIDYA NAGAR

Course Structure, M.Sc. Applied Science
Choice Based Credit System (CBCS)

SEMESTER- I

Course Code	Course Title	Teaching Scheme (Hours Per Week)					Evaluation (Marks)		
		L	S	P	Total Hrs.	Total Credits	Int.	Ext.	Total
PT01CASC01	Elements of Physical Sciences	3	1	-	4	4	30	70	100
PT01CASC02	Elements of Chemical Sciences	3	1	-	4	4	30	70	100
PT01CASC03	Elements of Biological Sciences	3	1	-	4	4	30	70	100
PT01EASC01	Earth, Earth Materials and Solar System	3	1	-	4	4	30	70	100
PT01EASC02	Quantitation of Biological Molecules & Introduction to Laboratory Medicine	3	1	-	4	4	30	70	100
PT01CASC04	Mathematical and Statistical Tools for Applied Science I	-	-	6	6	4	30	70	100
PT01CASC05	Practical in Physical, Chemical and Biological Sciences	-	-	6	6	4	30	70	100
PT01CASC06	Comprehensive Viva*	-	-	-	2	1	-	50	50

***Through Self Study Courses to be chosen by students**

L= Lectures, S=Seminar, P=Practicals

Credits (per semester*)

Theory + Seminar	: 16
Practical	: 08
Comprehensive Viva	: 01
Total	: 25

PT01CASC01

Elements of Physical Sciences

Unit I :

Introduction and Measurements; Vectors – Kinematics- Newton's Laws of Motion - Equilibrium - Uniform Circular Motion- Gravitationand Satellites. Energy, Momentum Conservations. Rotational Motion- Elasticity, Simple Harmonic Motion - Wave Motion – Fluids.
The Principle of Galilean Relativity-The Michelson–Morley Experiment-Einstein's Principle of Relativity-Consequences of the Special Theory of Relativity-The Lorentz Transformation-Equations. Relativistic Linear Momentum and the Relativistic Form of Newton's Laws-Relativistic Energy- Equivalence of Mass and Energy-Relativity and Electromagnetism- The General Theory of Relativity.

Unit-II :

Temperature and Heat: Thermal Expansion and the Gas Laws , Heat Transfer, Thermodynamics, The Kinetic Theory of Gases, Molecular Model of an Ideal Gas, Molar Specific Heat of an Ideal Gas, Adiabatic Processes for an Ideal Gas, The Equipartition of Energy, The Boltzmann Distribution Law, Distribution of Molecular Speeds, Mean Free Path.
Heat Engines and the Second Law of Thermodynamics: Reversible and Irreversible Processes-The Carnot Engine-Gasoline and Diesel Engines-Heat Pumps and Refrigerators. Entropy-Entropy Changes in Irreversible Processes-Entropy on a Microscopic Scale.

Unit-III :

Applications of Electrostatics: Applications Involving Charged Particles Moving in a Magnetic Field-The Hall Effect, The Biot–Savart Law, The Magnetic Force Between two Parallel Conductors, Ampère's Law, The Magnetic Field of a Solenoid, Magnetic Flux, Gauss's Law in Magnetism, Displacement Current and General Form of Ampère's Law, Magnetism in Matter-The Magnetic Field of the Earth, Faraday's Law of Induction-Induced emf and Electric Fields-Generators and Motors-Eddy Currents.
Maxwell's Equations: Maxwell's Equations and Hertz's Discoveries-Plane Electromagnetic Waves-Energy Carried by Electromagnetic Waves- Momentum and Radiation Pressure-Radiation from an Infinite Current Sheet, Production of Electromagnetic Waves by an Antenna-The Spectrum of Electromagnetic Waves. Brief review of plasma state of matter, Plane waves in tenuous plasma.

Unit- IV :

Semiconductor Physics and Bio-physics: Introduction to semiconductors, energy bands and charge carriers; p -n junction diode; bipolar junction transistors- construction, operation; Photo sensitive devices: photodiodes, photoconductive cells, solar cells, phototransistors, light-activated SCR.
Introduction to Molecular modeling: Building protein structure (amino acids and the primary structure, the peptide bond and secondary structure, etc.), nucleic acid structure (the chemical structure, the double helical structure of DNA, etc.).

Reference Books:

1. Fundamentals of College Physics, Dr. Peter J. Nolan, Pearson Custom Publishing.
2. Fundamental of Physics, Resnik and Halliday 8th Edition.
3. Biophysics, V. Pattabhi and N. Gautham, Narosa, 2nd Edition.
4. Solid State Electronic Devices, B. G. Streetman and S. Banerjee.
5. Electronic Devices and Circuits Theory, R. L. Boylestad and L. Nashelsky
5. Classical Mechanics, H. Goldstein, 3rd Edition.
6. Introduction to Electrodynamics, D. J. Griffiths, PHI, 3rd Edition.
7. Classical Electromagnetic Theory, J. Vanderlinde, John Wiley & Sons.

PT01CASC02
Elements of Chemical Sciences

Unit I: Inorganic Chemistry

Atomic structure: de Broglie matter waves, Hesienberg Uncertainty principle, atomic orbitals, Aufbau and Puli exclusion principles, Hund`s multiplicity rule, electronic configuration of elements:
Chemical Bonding: Covalent bond – valence bond theory and its limitations, types of hybridization and shapes of simple inorganic molecules and ions, VSEPR theory to NH_3, H_3O^+, SF_4 and H_2) etc. bond strength and bond energy, percentage of ionic character

Unit II: Organic Chemistry

Structure and bonding: Hybridization, bond length and angles, bond energy, localized and delocalized chemical bonds, van der Waals interactions, inclusion compounds, clatherates, charge transfer complexes, resonance, hyper conjugation, aromaticity
Mechanism organic reactions: Electrophiles and nucleophiles, types of organic reactions, reactive intermediates – carbocations, carbanions, free radicals, carbenes, arynes and nitriles (with examples), methods of determination of reaction mechanism (product analysis, intermediates, isotope effects, kinetic studies)

Unit III: Physical Chemistry

Gaseous state: Postulates of kinetic theory of gases, van der Waals equation of state, ideal behavior and deviations
Liquid state: intermolecular interactions, structure of liquids
Solid state: Definition of lattice, unit cell, space lattice, x-ray diffraction by crystals and Braggs equation
Chemical Kinetics: Rate laws and rate equations for first, second and third order equations,
Hal and mean life, activation energy and Arrhenius equation, determination of order of reaction, characteristics of catalyzed reactions

Unit IV: Thermodynamics:

Review of basics of thermodynamics including the laws of thermodynamics, Heats of summation-Hess law, Kirchoff equation, Clausi-Clapeyron – phase diagrams and Carnot cycles, open hydrostatic system and Gibbs- Duhem equation, Statistical thermodynamics – Canonical and

grand Canonical ensemble, partition function and derivation of thermodynamics functions, Statistical distribution functions- Maxwell- Boltzman, Fermi- Dirac and Bose-Einstein and Applications.

Reference Books:

1. Basic Inorganic Chemistry, F. A. Cottons, G. Wilkinson and P. L. Gauss, Wiley
2. Concise Inorganic Chemistry, J. D. lee, ELBS
3. Inorganic Chemistry, D. E. Shriver, P. W. Atkins, C. H. Langeford, Oxford
4. Organic Chemistry, Morrison and Boyd, Prentice – Hall
5. Organic Chemistry, Vols. I – III, S. M. Mukherjee, S. P. Singh and R. P. Kapoor, Wiley Eastern Ltd.
6. Fundamentals of Organic Chemistry, Solomons, John Wiley
7. Physical Chemistry, G. M. Barrow, International Student Edition, McGraw Hill
8. University General Chemistry, C. N. R. Rao, Macmillan
9. Physical Chemistry, R. A. Alberty, Wiley Eastern Ltd.
10. The Elements of Physical Chemistry, Atkins, Third Edition, Oxford

PT01CASC03

Elements of Biological Sciences

Unit I: Cell, Membrane structure and Function

Prokaryotic and Eukaryotic Cell, Microscopy, Cell fractionation, Nucleus, Endoplasmic reticulum, Golgi apparatus, Lysosomes, Mitochondria, Cytoskeleton (microtubules, Microfilament, Intermediate Filaments)
Membrane structure and Function: Membrane Models, Selective permeability, Active and passive transport, Exocytosis and endocytosis.

Unit II: Molecular and Chromosomal basis of inheritance

Molecular basis of inheritance: DNA- as genetic material experimental evidence, Organisation of Chromosome, DNA replication and repair.
Chromosomal basis of Inheritance: Mendelian inheritance, Morgan's experiment, Sex Linked inheritance, Linked Genes, Genomic imprinting, Genetic Disorders.

Unit III: Genes to Protein and Cell Cycle

Genes to Protein: Basic Principles of Transcription and Translation, Genetic Code, Mutation
Cell Cycle: Cell division, phases of Cell cycle, Cell Cycle control system.

Unit IV: Biomolecules and Metabolism:

Biological Molecules: Carbohydrates, Lipids, Proteins, DNA, RNA structure and function.
Stages of Cellular respiration, Catabolic pathways (Glycolysis, TCA cycle), redox reaction, Chemiosmosis.

Reference Books:

1. Biology, CAMPBELL. Reece (Eight Edition)
2. Biology, Raven
3. Life: Science of Biology, Sadva

PT01EASC01

Planet Earth and its Subsystems

Unit I: Dynamic interacting subsystems:

The Earth and the Solar System: Milky Way and the Solar System. Modern theories on the origin of the Earth and other planetary bodies. Earth's orbital parameters, Kepler's laws of planetary motion. A holistic understanding of planet Earth; lithosphere (crust, mantle and core), hydrosphere, atmosphere, cryosphere, magnetosphere and biosphere. Distribution of chemical elements in the solar system and on the Earth, chemical differentiation and composition of the Earth, Origin, basic properties and significance of the geo-magnetic field. atmosphere and oceans. Age of the Earth radioactive isotopes and their applications in earth sciences. Basic principles of stratigraphy. Theories about the origin of life and the nature of fossil record. Earth's gravity and magnetic fields and its thermal structure: Concepts of Geoid and, spheroid; Isostasy. Geological Time Scale; Space and time scales of processes in the solid Earth.

Unit II: Earth's Atmosphere and Radiation budget

Atmospheric turbulence and boundary layer. Structure and chemical composition of the atmosphere, lapse rate and stability, scale height, geopotential, greenhouse gases and global warming. Cloud formation and precipitation processes, air-sea interactions on different space and time scales. Insolation and heat budget, radiation balance, general circulation of the atmosphere and ocean.Climatic and sea level changes on different time scales. Coupled ocean-atmosphere system.El Nino Southern Oscillation (ENSO).Marine and atmospheric pollution, ozone depletion.

Unit III: The ocean sub-system

Oceans - Basic physical features, hypsography, Ocean currents and the Coreolis forces, waves and tides, mean-sea-level and ecstasy, The upper ocean, the coupled air-sea system and interactions. The ocean bottom surface and minerals, Paleoclimatic indicators, Geological records.
Physical and chemical properties of sea water and their spatial variations. Residence times of elements in sea water. Ocean currents, waves and tides, important current systems, thermohaline circulation and the oceanic conveyor belt. Major water masses of the world's oceans. Biological productivity in the oceans.

Unit IV: Geophysical Fluid Dynamics

Equation of motion for a rotating stratified theory, scaling analysis, potential vorticity dynamics line Motion of fluids, waves in atmospheric and oceanic systems. waves, energetic and instability theory with application to the mean circulation and venturing

Reference Books:

1. An Introduction to Dynamic Meteorology, J. R. Ho Hon. Academic Press.
2. Atmosphere Ocean Dynamics, Adrian E. Gill, Academic Press.
3. Planet Earth, Cesare Emiliani, Cambridge University Press (Low Priced Edition)
4. Atmosphere Ocean Dynamics, Adrian E. Gill, Academic Press.

PT01EASC02

Quantitation of Biological Molecules and Introduction to Laboratory Medicine

Unit I: Basics of Scientific Calculations & Quantitation of DNA, RNA and Protein

Scientific Notation, Metrix Prefixes, Significant digits, exponent and scientific notion, Metrix Prefixes Solution Mixture and Media, Molarity, Normality, Dilution, Acid base chemistry, Spectrophotometry calculation, Protein Calculation (protein Molecular Weight, Protein Quantification, Isoelectric point determination), Nucleic acid quantification (Determining Concentration of Double Stranded DNA, Determining Concentration of single Stranded DNA, oligonucleotide Quantification, Measuring RNA concentration and Molecular Weight, Molarity and Nucleic acid length)

Unit II: Calculation based on Radioactivity and other modern techniques

Isotopes in Biochemistry, Determination of biological half life, Radioactive Decay, Labelling of Nucleic Acid with radioisotopes, Calculation required for Growth Kinetics, PCR, Real Time PCR, Recombinant DNA technology, Nanotechnology and Chromatography.

Unit III: Clinical Pathology, Haematology & Clinical Biochemistry:

Physical, chemical, Microscopic Examination of Urine, Sputum, Faeces, Cerebrospinal fluid (CSF) and other body fluids, Normal constituents of Blood, their structure and function, Collection of Blood samples and various Anticoagulants, Hb, PCV, ESR, Normal Haemostasis, Bleeding Time, Clotting Time, Prothrombin Time, Activated Partial Thromboplastin Time. Blood grouping and Rh Types, Cross matching.
Blood sugar regulation (Hormonal), Abnormalities, Diabetes mellitus, GTT, Glycated-Hemoglobin, Liver function tests, Renal function tests, Pancreatic function tests, Thyroid function tests, Cardiac function test.

Unit IV: Clinical Microbiology & Hospital Infection Control:

Classification of microorganisms, Size, shape and structure of bacteria, Use of microscope in the study of bacteria. Principles and use of equipments of sterilization namely Hot Air oven, Autoclave and serum inspissator, Antiseptic and disinfectants, Nutrition, growth and multiplications of bacteria, Culture and antimicrobial sensitivity test, Principles of common serological tests namely Widal, VDRL, HIV and HBsAg, Diseases caused *Staphylococci, E. coli, Pseudomonas, Salmonella, Mycobacteria, E.histolytica, Plasmodium*, Hepatitis viruses and HIV.

Prevention and control of Health-care associated infections (HAIs): Types of HAIs, Routes of transmission. Measures for prevention and Control, Bio-medical Waste (BMW) Management.

Reference Books:

1. Biochemical Calculation, Irwin H. Segel
2. Calculation in Molecular Biology and Biotechnology, Frank H. Stephenson
3. Biochemical Calculations, Biostatistics, E. Padmini
4. A Guide to Lehninger Principles of Biochemistry

PT01CASC04

Mathematical and Statistical Tools for Applied Science I

Unit I :

A Calculus refresher- functions and their derivatives – derivative as rate of change – Higher Order Derivatives - Maxima and Minima – Integration - Partial Derivatives – Taylor series - Gradient, Divergence and Curl - Hessian- Maxima and Minima.
Vectors in R^n and matrices- algebra of matrices- inverse of a matrix- determinant and trace- eigen values and eigen vectors- projections and orthogonal matrices.

Unit II:

Ordinary differential equations- linear equations of first and second order –systems of linear differential equations- stability of solutions of linear systems of ODE- Legendre, Hermite and Bessel equations and polynomials.
Partial differential equations of science and method of reparation of variables-Applications.

Unit III:

Numerical Analysis- Newton Method for implicit equation f (x) = 0–Eular's method and Rumge-Kutta method for ordinary differential equations – Methods of Elementary Error Analysis.
Collection and classification of data- frequency table- graphical representations of data- measures of central tendency: mean, median, mode- measures of dispersion: variance standard deviation, coefficient of variation.

Unit IV:

Random Variables- probability- joint, marginal and conditional probability – discrete and continuous random variables – probability distribution functions- Expectation and Moments – Binomial, Poisson and Normal distributions- a compendium of some other distribution functions.
Testing of hypotheses – goodness of fit tests- chi-square test- tests of significance- one sample tests for mean- z test and t-test – two sample tests for means and variance.

Reference Books:

1. Introduction to Geochemical Modelling, Francis Albarede, Cambridge University Press.
2. Higher Engineering Mathematics (37^{th} Edition), B. S. Gerwal, , Khanna Publishers
3. Pisani and Purves – Statistics, Freedman, W.W. Norton & Co.

PT01CASC05

Chemical Sciences

1. To determine the percentage of two optically active substances in a given Solution polarimetrically.
2. Determination of dissociation constant, Ka for aspirin by pH metry.
3. To determine the rate constant of hydrolysis of methyl acetate catalyzed by an acid, and also the energy of activation.
4. Synthesis of o- and p-nitrophenol from phenol.
5. Separation of o- and p-nitrophenol by steam distillation method.
6. Pinacol-Pinacolone re-arrangement
7. Emulsion polymerization of methyl methacrylate using free radical initiator
8. Solvent-Free Cannizzaro Reaction involving grinding of liquid 2-chlorobenzaldehyde with potassium hydroxide
9. Preparation of Ni-DMG complex and determination of Ni2+by gravimetric method.
10. Preparation of Nickel Ammonium sulphate and determine its %age purity by estimating Nickel volumetrically.

Physical Sciences

1. Electron- diffraction: Analysis of electron diffraction pattern and determination of the Inter-planar distance of the crystal.
2. Phase Angle measurement by Cathode Ray Oscilloscope (CRO) and then to determine the unknown Capacitance/ Resistance/ Operating Frequency of the circuit.
3. Determination of the Energy Bandgap (Eg) of a Semiconductor by studying the reverse bias characteristics of diode at different temperatures.
4. Ultrasonic Interferometer.
5. Geiger Muller (G. M.) Counter: To study the GM Characteristic to determine the operating voltage of the counter and then to study the absorption of beta rays through metals.
6. Simulation of radio activity: To determine the half-life of a radioactive material.
7. Logic Gates: Basic Logic gates and its applications as parity checker, Grey to BCD code converter, Half adder etc.
8. Dissociation Energy of Iodine (I2) Molecules: Estimation of the dissociation energy of I2 molecule by studying its vibrational spectra.
9. Laser beam Characteristics: To determine the basic parameters of a laser beam.

Biological Sciences:

1. Determination of λmax of a given dye (Beer's and Lambert's law).
2. Measurement of partition coefficient index.
3. Amino acid separation by Thin Layer Chromatography.
4. Protein estimation by Folin-Lowery Methodology.
5. Glucose estimation by DNS method.
6. Glucose estimation by GOD-POD (enzymatic method).
7. Mitochondrial staining.
8. Study of cell division (Mitosis).
9. DNA estimation by DPA method.
10. RNA estimation by orcin

SARDAR PATEL UNIVERSITY
VALLABH VIDYA NAGAR
Course Structure, M.Sc. Applied Science
Choice Based Credit System (CBCS)

SEMESTER- II

Course Code	Course Title	Teaching Scheme (Hours Per Week)					Evaluation (Marks)		
		L	S	P	Total Hrs.	Total Credits	Int.	Ext.	Total
	SECOND SEMESTER (650 Marks)								
PT02CASC01	Synthesis and Properties of Materials	3	1	-	4	4	30	70	100
PT02CASC02	Instrumentation	3	1	-	4	4	30	70	100
PT02CASC03	Characterization Techniques	3	1	-	4	4	30	70	100
PT02EASC01	Environmental Science, Health & Safety	3	1	-	4	4	30	70	100
PT02EASC02	Computer Aided Design (CAD) and Computer Aided Manufacturing (CAM)/ Instrumentation	3	1	-	4	4	30	70	100
PT02EASC03	Environmental, Ocean and Atmosphere Science	3	1	-	4	4	30	70	100
PT02CASC04	Experimental Methods-I	-	-	6	6	4	30	70	100
PT02CASC05	Experimental Methods-II	-	-	6	6	4	30	70	100
PT02CASC06	Comprehensive Viva	-	-	-	1	1	-	50	50

L= Lectures, S=Seminar, P=Practicals

Credits (per semester*)

Theory + Seminar	: 16
Practical	: 08
Comprehensive Viva	: 01
Total	: 25

PT02CASC01

Synthesis and Properties of Materials

Unit I: Introduction to Various Materials

Introduction to Materials & Materials Science. Type of materials, Properties of materials, levels of structure, processing of materials, structure- property – processing relationship. Environmental effect of Materials behavior, Materials selection.

Unit II: Methods of Synthesis of Polymeric Materials

Macromolecular concepts, structural feature of polymers, correlation between structure and properties of various polymerization methods. Bulk, solution, suspension and emulsion polymerization techniques, interfacial, melt and solution polycondensation, some other miscellaneous techniques.

Unit III: Glass and Ceramic Materials

Various types of ceramics, phase diagrams, principles of main fabrication techniques. Nature of glass, structure, glass forming systems, silicate systems, non-silicate systems, Types of Glasses, manufacture of glass.

Unit IV: Metals and Alloys

Fe-Fe_3C phase diagram, pearlite, bainite, martensite, cementite, heat treatments processes, classification of steels and their applications. Aluminium alloys, magnesium alloys, copper alloys, nickel, cobalt, zinc alloys, titanium alloys, refractory metals.

Reference Books:

1. The Science and Engineering of Materials, Donald R. Askeland PWS-Kent Publishing
2. Polymer Science, V R. Gowarikar, N. V. Vishwanathan and J. Sreedhar, Wiley Publications
3. Principles of Polymer Science, P. Bahadur and N. V. Sastry, Narosa Publishers, New Delhi
4. Materials Science and Metallurgy, V.D. Kodgire Everest Publishing House.
5. Physical Metallurgy: Principles and Practice, V. Raghavan, PHI Learning Publishers
6. Science of Engineering Materials: Manas Chanda, Macmillan Publishers
7. Ceramic Hardness, Ian McColm, Springer Publications

PT02CASC02

Instrumentation

Unit I: Characteristics of Instruments

Generalized scheme of a measurement systems, basic methods of measurements, Errors in measurements, types of errors, Reliability of measurement systems, failure rate, reliability improvement, availability, redundancy, choice of components, and materials, Different types of

noises in measurements and its suppression methods. Static characteristics of instruments – accuracy, precision, sensitivity, linearity, resolution, hysteresis, threshold, input impedance, loading effect – generalized mathematical model of measurement systems – dynamic characteristics – Modeling of Transducers – operational transfer function – zero, first and second order instruments – impulse, step, ramp and frequency response of the above instruments-techniques for dynamic compensation.

Unit II: Transducers

Classification and Basic requirements of Transducers, selection of transducers, Principles of displacement Transduction, circuit based on transduction. Temperature transducer, displacement transducer, pressure transducers and catheter tip transducers, Strain: Factors affecting strain measurements, operation of resistance gauge, types of Characteristics devices Piezoelectric: Phenomenon Force, strain, torque, photoconductive and photo-emissive transducers, Ionization displacement transducer, nuclear radiation transducer, radioactive transducers, digital transducers.

Unit III: Process Measurements & Sensors

Pressure: Diaphragms, Elastic elements, Transduction Methods, Solid state, thin film, Calibration, Platinum type sensors, Thermisters, Thermocouples, IC Temperature Sensors, Radiation measurement, optical pyrometers, calibration, Force: Load cell and its types, Torque measurement and its types.

Unit IV: Optoelectronics

Optical sources: LED- Introduction, Structures & characteristics, LASER-Basic concepts, optical Emission from semiconductor & non semiconductor LASERs. Optical detectors: Introduction, detection principles, absorption, quantum efficiency, responsively, Long wavelength cut off, phototransistors and photoconductive detectors. Optical fiber, Ray theory, single mode fibers, attenuation, losses, dispersion, polarization, Refractive Index profile, cut off wavelength measurement etc. advantages/ disadvantages and various applications.

Reference Books:

1. Instrumentation devices & Systems, C. S. Rangan, G. R. Sarma & S. V. Mani, TATA McGraw Hill Publishing Company Limited.
2. Transducers and Instrumentation, D. V. S. Murty, Prentice Hall of India Pvt. Ltd.
3. Instrumentation Measurement and Analysis, B. C. Nakra & K. K. Chaudhry, TATA McGraw Hill Publishing Company Limited.
4. Principles of Industrial Instrumentation, D. Patranabis, TATA McGraw Hill Publishing Company Limited.
5. Electronic Instrumentation, Kalsi H. S., TATA Mcgraw Hill Education
6. Electronic Instrumentation and Instrumentation Technology, M. M. S. Anand, Prentice Hall of India, New Delhi
7. Optical fiber communications-Principles and Practice, John M. Senior, Pearson Education
8. Semiconductor Optoelectronic Devices, Pallabh Bhattacharya, Prentice Hall of India Pvt. Ltd.
9. Advanced Electronic Communication System. Wayne Tomasi, Prentice Hall of India Pvt. Ltd.

PT02CASC03

Characterization Techniques

Unit I:

X-ray spectrum, instrumentation of X-ray spectrometry, X-ray diffractometers, X-ray absorption meter,, X-ray fluorescence spectrometry, Electron probe microanalyzer, Qualitative analysis : basic principles, powder diffraction file, Hanawalt method, Fink method, procedure, Examples of analysis : single phase, mixture of phases, computer searching, practical difficulties, Quantitative analysis : single phase, multiphase, external standard method.

Unit II:

Optical microscopy, Transmission electron microscopy, Field ion microscopy, Scanning Electron Microscopy, Scanning tunneling microscopy, atomic force microscopy: principles and their applications, Specimen preparation techniques for microscopy, X-ray photoelectron spectroscopy, Auger electron spectroscopy, and Secondary ion mass spectrometry: principle and applications.

Unit III:

Thermogravimetric analysis, differential thermal analysis, differential scanning calorimetry, thermomechanical analysis and dilatometry: Principles, instrumentation and applications, Electrophoresis techniques: paper electrophoresis- methods of zone localization, quantitative considerations, evaluation of the curves, electrophoresis apparatus, capillary electrophoresis. Types of NMR spectrometers, constructional details of NMR Spectrometer, Detailed description of ESR Spectrometer.

Unit IV:

Spectrophotometers : single beam, double beam, microprocessor based Spectrophotometer, Perkin Elmer LAMDA 9 Double beam Spectrophotometer, high performance spectrophotometers, dual wavelength spectrophotometer basic components of infrared spectrophotometers, Fourier transform infrared spectroscopty (FTIR), Attenuated total reflectance (ATR) technique, Fluorescence Spectroscopy : Microprocessor based Spectrofluorometer, Raman Spectrometer, PC-based Raman spectrometer.

Reference Books:

1. Elements of X-ray diffraction, B. D. Cullity, Addison-Wesley Publishing Company Inc
2. A Guide to Materials Characterization and Chemical Analysis, John. P. Sibilia, Wiley Blackwell Publishers
3. Introduction to Nanotechnology, Charles P. Poole Jr. and Frank J. Owens.
4. Characterization of Materials, Vol. 2, Elton N. Kaufmann. A Wiley-Interscience Publication
5. Modern Physical Techniques in Materials Technology, T. Mulvey and R. K. Webster, Oxford University Press

PT02EASC01

Environmental Science, Health and Safety

Unit I: Introduction

Degradation of Materials in different Environments: Atmospheric, underground marine & Industrial environment pollution, vacuum and space environment, biophysical; Sources of air pollutions, water pollution (fluoride and arsenic contamination); Industrial Effluents, pollution due to Sewage and Sludge, pesticides pollution, Solid waste problems, metal pollutants (e.g., As and fluoride); Environmental carcinogens, Control of pollution; Effects of heat, radiation and moisture.

Unit II: Degradation and Weathering of Materials

Weathering, Air & Moisture, Radiation and Heat, Pollutants, Microbial degradations, Control of deterioration, thermal protection; Optical properties, solar cells, Lubrications, sublimation/evaporation, loss of materials; Thermal shock. Life tests such as Dry heat tests; Damp Heat Tests; Altitude Tests for Contaminants, water Immersion Tests, Protection against fungal attack.

Unit III: Protection of Materials

Controlled Environment, Packing, Insect proof packaging, Rodent proof packing, Air Conditioning, Constant damp heat and cyclic damp heat, Humidity and cycles of humidity, Nuclear planer plant, radiation safety measures, radioactive isotope, solar flash, cosmic and cosmic radiation

Unit IV: Modeling of Environment Effect

Field exposure trials, climatic trials, Climatic trial with one correspondence; Accelarated Trial, Reliability, Creep-properties, Stress properties, Fatigue properties, Microstructure and Materials Economy and Control.

Reference Books:

1. Theory of Corrosion and Protection of Metals, Tomashov N. D., The Macmillan Company
2. Corrosion engineering, M. G. Fontana, TATA McGraw Hill Edition, Published by Tata McGraw Hill Publishing Company Limited
3. Science of Engineering Materials, Manas Chanda, Macmillan Publishers
4. Waste recycling for energy conservation, Davidkut and Gerard Nare
5. Irwing Kaplan- Nuclear Physics, Addison-Wesley Publishing Company
6. Kenneth S. Krane-Introductory Nuclear Physics, Wiley Publications

PT02EASC02

Computer Aided Design (CAD) and Computer Aided Manufacturing (CAM)

Unit I&II : Introduction to Computer Graphics Fundamentals and CAD

Output primitives (points, lines, curves, etc.)
Introduction to basic 2-D transformations (translation, scaling, rotators)
Introduction to windowing and viewports
Introduction to the concept of CAD, fundamental of CAD
Creating and manipulating designs and drawings of various objects
Examples and important features of CAD software

Unit III& IV: Modeling, Assembly and CAM

Introduction to solid modeling, rapid prototyping
Creating wireframe models
Surface modeling
Assembly of parts
Introduction to the concept of CAM, Fundamentals of CAM
Examples and important features of CAM software

Labe Exercises for CAD/CAM

Working with commands and Simple Objects
Understanding of holes, cuts and model tree relations
Creation shafts, rounds, chamfers and slots
Sketch Tools & Datum planes
Creation of objects by revolved features, patterns and copies, sweeps and blends
Creation of engineering drawing details such as dimensioning, sectional views, adding esthetics
Assembling of part models using constraints
Assembly operations - part modifications, adding another assembly features – display.
3D Modeling
Surfacing of parts

Reference Books:

1. Computer Graphics, Donald Hearn and .M. Pauline Baker, Prentice Hall ,Inc., 1992
2. CAD/CAM - Theory and Practice, Ibrahim Zeid, McGraw Hill, International Edition, 1998.
3. CAD/CAM – Computer Aided Design and Manufacturing, Mikell P Groover and Emory W Zimmers Jr., Prentice Hall International
4. Mastering CAD/CAM, Ibrahim Zeid, Tata McGraw-Hill Edition, New Delhi
5. CAD/CAM, PN Rao, Prentice-Hall India

PT02EASC03

Earth Materials, Surface Features and Interior Processes

Unit-I:

Gross composition and physical properties of important minerals and rocks; properties and processes responsible for mineral concentrations; nature and distribution of rocks and minerals in different units of the earth and different parts of India. Nature of the fossil record, taphonomy; growth, allometry and heterochrony; species concepts and systematics – nomenclature, classification and phylogenetics; adaptation and functional morphologic analysis; evolutionary rates and trends; global diversity and extinction, mass extinctions, Applications of fossils in biostratigraphy, Definition of stratigraphy: Classification of bedding; Basis of stratification; Types and recognition of stratification; Stratification and rock sequence; Indian stratigraphy. Code of stratigraphic nomenclature, Processes of sedimentation, Stratigraphic classification and correlation. Processes controlling stratification- physical, chemical and biological

Unit-II:

Surface features and Processes: Physiography of the Earth; weathering,erosion, transportation and Deposition of Earth's material; formation of Soil, sediments and sedimentary Rocks: Sedimentary Processes: Introduction to basic concepts: Developments in sedimentology, description and classification of sedimentary rocks, sedimentary environments and facies, earth's sedimentary shell. Weathering and sedimentary flux: Physical and chemical weathering, submarine weathering, soils and pale soils. Fluid flow, sediment transport and sedimentary structures: Types of fluids, Laminar, turbulent flow, Reynoldsnumber, Froude Number, Boundary layer effect, Particle entrainment, transport and deposition, sediment gravity flows, Concept of flow regimes and bed forms. ; Energy balance of the Earth's surface processes; physiographic features and river basins in India.

Unit -III

Interior of the Earth: Mineralogy of the Earth's core (Native Elements: S, Fe, Ni), Upper mantle mineralogy and structures (Olivine, Inosilicates - pyroxene, Amphiboles), Mantle Transition Zone; minerals/ structures (oxides and spinel structure, other oxides and structures) Lower Mantle minerals/structures (perovksite, garnet structures; post-perovskite), Mineralogy of the Earth's crust -composition of crust, silicate structures and minerals.Physical properties of minerals: form and structure, colour and transparency, lustre, streak, specific gravity, hardness, cleavage, fracture, para-, dia- and ferromagnetic properties, radioactivity, Classification of minerals on the basis of chemical composition, Periodicity and symmetry-concept of space lattice. Crystal structure of minerals-CCP, HCP packing, Defects in minerals- point defects, line defects, and planar defects. Mineralogical phase rule of closed and open system.

Unit-IV

Deformation and Plate Tectonics: Basic concepts of seismology and internal structure of the Earth, Physio-chemical and seismic properties of Earth's interior. Concepts of stress and strain, Behavior of rocks under stress; Folds, joints and faults. Earthquakes - their causes and

measurement. Interplate and intraplate seismicity.Definition of metamorphism, Factors controlling metamorphism Types of metamorphism - contact, regional, fault zone metamorphism, impact metamorphism. Metamorphic zones and isograde s.Concept of metamorphic facies and grade.Structure and textures of metamorphic rocks.

Reference Books:

1. The manual of Mineral Science, Cornelis Klein and Barbara Dutrow, Wiley Publication
2. Optical mineralogy, P. K. Verma, CRC Press.
3. An Introduction To The Rock Forming Minerals, Deer, W. A., Howie, R. A. and Zussman, J., ELBS Publications.
4. An Introduction to Mineral Sciences, Putnis, Cambridge Publication.
5. Optical Mineralogy, P. F. Kerr ,McGraw-Hill.

Self- Study Course:

Mathematical, Statistical and Design Tools for Applied Science

Eigen values of a matrix- computation of eigen values and eigen vectors. Legendre equation – Bessel equation –Runge-Kutta method for systems of equations. Resume of calculus of several variables – gradient, divergence and curl - Resume of partial differential equations – equations of science - Finite difference method for partial differential equations.

PET02CAS04

EXPERIMENTAL METHODS –I (Any Eight of the Following)

1. Qualitative analysis of hydrophobic drugs by liquid chromatography mass spectroscopy method (LCMS).
2. Determination of moisture content of given sample by Karl-Fischer Titrator.
3. Synthesis of Urea-Formaldehyde Resins and identify % free formaldehyde from the synthesized resin.
4. Synthesis of Phenol -Formaldehyde Resins and identify % free formaldehyde from the synthesized resin.
5. Quantitative determination of given sample solution by UV-Vis Spectroscopy.
6. Identify the functional groups present in the given sample by FTIR spectral techniques.
7. Thermo gravimetric (TGA) and differential scanning calorimetric (DSC) analysis of Calcium oxalate sample.
8. Synthesis of Melamine -Formaldehyde Resins and identify % free formaldehyde from the synthesized resin.
9. Separation of proteins by SDS gel electrophoresis (SDS PAGE)
10. Elemental analysis and quantitative determination of sediment using elemental analyzer

PET02CAS05

EXPERIMENTAL METHODS –II (Any Eight of the Following)

1. Error estimations in experimental observations and method of least square fit
2. Study of Hall Effect in semiconductor and to determine Hall Co-efficient, Hall voltage, carrier density, carrier Mobilities and find out Type of the semiconductor.
3. Characteristics of the Linear Variable Differential Transducer (L.V.D.T)
4. I-V-T characteristics of LED below the barrier voltage Vo (firing voltage) (ON voltage) and to find out the material constant η and the barrier voltage Vo, also to estimate the Planck's constant based on the LED characteristics
5. Study of the strain gauge characteristics
6. Study of the Load cell characteristics
7. Study of the LASER beam Diode characteristics. Determination of Optical Power (Po) of a Laser Diode and LASER diode Forward current (Ip)
8. Determination of the Curie temperature for ferroelectric materials
9. Study of the Thomson effect and Peltier effect using Thermocouple
10. Design and Construction of a 4 bit R 2R ladder DAC (digital to analog conversion) circuit and ADC (analog to digital circuit). To plot the curve of 4 bit R 2R ladder DSC circuit
11. Antenna Characteristics: (i) To plot the radiation pattern in E- & H- planes. (ii) To determine 3-dB beam width in both planes and compute directivity. (iii)To determine gain using two identical horn antennas and compute radiation efficiency

SARDAR PATEL UNIVERSITY
VALLABH VIDYANAGAR

Course Structure, M.Sc. Applied Science- III
Choice Based Credit System (CBCS)
Biomedical Science & Technology

Course Code	Course Title	Teaching Scheme (Hours Per week)					Evaluation (Marks)		
		L	S	P	Total Hrs	Total Credits	Internal	External	Total
PT03CBMT01	Techniques and Applications of Medical Imaging	3	1	-	4	4	30	70	100
PT03CBMT02	Biomaterials and Bionanotechnology	3	1	-	4	4	30	70	100
PT03CBMT03	Advanced Biomaterials And Related Anatomy/ Physiology	3	1	-	4	4	30	70	100
PT03EBMT01	Biodynamics	3	1	-	4	4	30	70	100
PT03EBMT02	Medical Sensors, Diagnostics And Clinical Pharmacology	3	1	-	4	4	30	70	100
PT03CBMT04	Experimental Methods- III	-	-	6	6	4	30	70	100
PT03CBMT05	Experimental Methods- IV	-	-	6	6	4	30	70	100
PT03CBMT06	Comprehensive Viva	-	-	-	1	1	-	50	50

L= Lectures, S=Seminar, P=Practicals

Credits (per semester*)

Theory + Seminar : 16

Practical : 08

Comprehensive Viva : 01

Total : 25

SARDAR PATEL UNIVERSITY
VALLABH VIDYA NAGAR

Course Structure (Semester III), M.Sc. Applied Science
Choice Based Credit System (CBCS)
Defence Science & Technology

Course Code	Course Title	Teaching Scheme (Hours Per Week)					Evaluation (Marks)		
		L	S	P	Total Hrs.	Total Credits	Int.	Ext.	Total
	THIRD SEMESTER (650 Marks)								
PT03CDT01	Composite Materials and its Applications to Defense needs	3	1	-	4	4	30	70	100
PT03CDT02	Sensors & Devices	3	1	-	4	4	30	70	100
PT03CDT03	Antenna Systems & Radars	3	1	-	4	4	30	70	100
PT03EDT01	Robotics & Manufacturing Systems	3	1	-	4	4	30	70	100
PT03EDT02	Automation & Control	3	1	-	4	4	30	70	100
PT03CDT04	Experimental Methods III	-	-	6	6	4	30	70	100

SARDAR PATEL UNIVERSITY

VALLABH VIDYA NAGAR

Course Structure, M.Sc. Applied Science- III
Choice Based Credit System (CBCS)
Earth System Science

Course Code	Course Title	Teaching Scheme (Hours Per Week)					Evaluation (Marks)		
		L	S	P	Total Hrs.	Total Credits	Int.	Ext.	Total
	THIRD SEMESTER (650 Marks)								
PT03CESS01	Geophysics	3	1	-	4	4	30	70	100
PT03CESS02	Geochemistry	3	1	-	4	4	30	70	100
PT03CESS03	Climate Dynamics and Earth System Interactions	3	1	-	4	4	30	70	100
PT03EESS01	Remote Sensing, GPS, Earth Resources and Future Energy Options	3	1	-	4	4	30	70	100
PT03EESS02	Geo-Informatics, GPS, Natural and manmade Hazards and Global warming	3	1	-	4	4	30	70	100
PT03CESS04	Practicals (Experimental Methods-III)	-	-	6	6	4	30	70	100
PT03CESS05	Practicals (Experimental Methods-IV)	-	-	6	6	4	30	70	100
PT03CESS06	Comprehensive Viva	-	-	-	1	1	-	50	50

Biomedical Science & Technology

PT03CBMT01

Techniques and Applications of Medical Imaging

Unit I: Introduction And Fundamentals Of X-Ray And Medical Imaging

Introduction to medical imaging technology, systems and modalities. Brief history; importance; applications; trends; challenges; X-rays: Production X-rays, various components of radiographic systems, X-ray tube design, X-ray spectrum, rating charts of X-ray tubes. Electrical circuit for X-ray m/c, filament circuits and mA control, HT circuits, KV control, control of exposure timers, collimators, scatter and grids, absorbed dose, basics of tables and arms, properties of X -ray films and screens, dark room accessories, types of X-ray tubes for various medical applications (Low KV imaging, high KV imaging, mammography X-ray system. Biological effects of radiation: radio sensitivity, physical and biological factors; measures for radiation protection.

Unit II: Medical Imaging Techniques

Photography and film image: Principle of photography and radiographic film image, film sensitometry, information content of an image, image quality factors (resolution, contrast, noise), MTF. Detectors: ionization chamber, proportional counter, Geiger-Muller counter, scintillation detectors, semiconductor radiation detector, efficiency and sensitivity of detectors. Image intensifier, automatic brightness control system, image distortion and artifacts. Fluoroscopy and angiography: Over view of Fluoroscopic imaging system, principle, specific system design. Digital fluoroscopy-c-arm system. Digital subtraction angiography (DSA), digital subtraction programming

Unit III: Advanced Medical Imaging Tools

Introduction to digital image: Signal input, image matrix, digital image quality, digital image processing, picture archiving and communication system (PACS). X-Ray computed tomography: Principles of sectional imaging, scanner configuration, detectors, data acquisition system, image formation principles, conversion of x-ray data in to scan image. 2D image reconstruction techniques: back projection, iterative and analytical methods. Viewing system, image quality and artifacts

Unit IV: Applications of Medical Imaging

Ultra Sound in Medicine: Introduction, production of ultrasound, acoustic impedance, ultrasonic transducers and types, transmitter and detector principles, probe design, principles of image formation. Display system: principles of A-mode, B-mode and M-mode display. Principles of scan conversion (real time imaging), image processing, Doppler Ultra sound and Color flow mapping. Application of diagnostic ultra sound. Magnetic Resonance Imaging: Introduction, principles of MRI, MRI instrumentation, magnets, gradient system, RF coils- receiver system. Relaxation processes, pulse sequence, image acquisition and reconstruction techniques, Functional MRI - Application of MRI. Radio isotope imaging / Nuclear medicine: Radio nuclides for imaging,

radionuclide production: cyclotron production, reactor production, generator production. Rectilinear scanners, linear scanners, SPECT, PET, Gamma Camera, Comparison of other tomographic techniques. Principle of Computed Tomography (CT) Scan, Operational Modes, First, second, third and fourth generation scanner, System Components and Gantry

Reference Books:

1. Bioinstrumentation, J. G. Webster, Wiley and Sons.
2. Handbook of Bio-Medical Instrumentation, R. S. Khandpur, Tata McGraw Hill Publications, 2nd Ed.
3. The Physics of Diagnostic Imaging, D. D. Dowsett, A. P. Kenny, R. E., Johnston, CRC Press, 2nd Ed.
4. Fundamentals of Medical Imaging, P. Suetens, Cambridge University Press; 2nd Ed.
5. Biomedical Signal and Image Processing, K. Najarian, Splinter, R. CRC Press, 2nd Ed.
6. Digital Image Processing for Medical Applications, G. Dougherty, Cambridge University Press; 1st Ed.
7. Biosignal and Medical Image Processing (Signal Processing and Communications), John L. Semmlow, 2nd Ed.

PT03CBMT02

Biomaterials And Bionanotechnology

Unit I: Biomaterials

Introduction: Definition of biomaterials, applications of biomaterials, classification of biomaterials, Comparison of properties of some common biomaterials. Effects of physiological fluid on the properties of biomaterials. Biological responses (extra and intra-vascular system). Surface properties of materials, physical properties of materials, mechanical properties.

Unit II: Types Of Implant Materials

(i) Overview of Metallic implant materials: Stainless steel, Co-based alloys, Ti and Ti-based alloys. Importance of stress-corrosion cracking, corrosion behavior and the importance of passive films for tissue adhesion.

(ii) Overview of Polymeric implant materials: types, general classification; some commonly used polymers: Polyolefins, polyamides, acrylic polymers, fluorocarbon polymers, silicon rubbers, acetals. (Classification according to thermosets, thermoplastics and elastomers). Viscoelastic behavior: creep-recovery, stress- relaxation, strain rate sensitivity. Importance of molecular structure, hydrophilic and hydrophobic surface properties, migration of additives (processing aids), aging and environmental stress cracking. Physiochemical characteristics of biopolymers. Biodegradable polymers for medical purposes, Biopolymers in controlled release systems. Synthetic polymeric membranes and their biological applications.

(iii) Overview of Ceramic implant materials: Definition of bioceramics. Common types of bioceramics: Aluminum oxides, Glass ceramics, Carbons. Bioresorbable and bioactive ceramics. Importance of wear resistance and low fracture toughness. Host tissue reactions: importance of interfacial tissue reaction (e.g. ceramic/bone tissue reaction).

(iv) Overview of Composite implant materials: different reinforcement materials, Composite theory of fiber reinforcement (short and long fibers, fibers pull out). Mechanics of improvement of properties by incorporating different elements.

Unit III: Testing Of Biomaterials

Biocompatibility and toxicological screening of biomaterials: Definition of biocompatibility, blood compatibility and tissue compatibility. Toxicity tests: acute and chronic toxicity studies (in situ implantation, tissue culture, haemolysis, thrombogenic potential test, systemic toxicity, intracutaneous irritation test), sensitization, carcinogenicity, mutagenicity and special tests. Testing of biomaterials/Implants: In vitro testing (Mechanical testing): tensile, compression, wears, fatigue, corrosion studies and fracture toughness; physiochemical testing: swelling, hydrophilicity, Molecular weight determination, degradation study. In-vivo testing (animals): biological performance of implants. Ex-vivo testing: in vitro testing simulating the in vivo conditions. Standards of implant materials; Sterilization techniques: ETO, gamma radiation, autoclaving. Effects of sterilization on material properties.

Unit IV: Nanobiotechnology

Introduction, Nanomaterials and biosystem interaction; biomedical nanotechnology (Diagnostics, delivery and therapeutics), Nanotoxicology, Applications of Nano-Materials in Biosystems: Proteins - Lipids - RNA and DNA; Protein Targeting - Small Molecule/ Nanomaterial - Protein Interactions; Nanomaterial-Cell interactions-Manifestations of Surface Modification (Polyvalency).Nanoparticles for drug delivery (including solid lipid nanoparticles, synthetic and biopolymeric nanoparticles), carbon nanotubes, polymeric nanofibers, Implications in neuroscience, tissue engineering and cancer therapy. Lipid Nanoparticles and inorganic nanoparticles for drug delivery.

Reference Books:

1. Biomaterials - Science and Engineering, J. B. Park, Plenum Press.
2. Biomaterials, S.V. Bhat, Narosa Publishing House, 5th Ed.
3. Biological Performance of materials: Fundamentals of Biocompatibility, J. Black, 4th Ed.
4. Blood Compatible Materials and Devices: Perspective towards 21st Century, C. P. Sharma, M. Szycher, (Eds) Technomic Publishing Company.
5. Polymeric Biomaterials, E. Piskin, A. S. Hoffmann, (Eds), Martinus Nijhoff Publishers.
6. Biomedical Polymers, D. G. Eugene, A. Nakajima. Academic Press.

PT03CBMT03

Advanced Biomaterials And Related Anatomy / Physiology

Unit I: Types Of Biomaterials

Structure and property relationships in materials, ceramics and polymers; Collagen, hyaluronic acid and other biopolymer applications, Interactions of materials with the human body; Influence of microstructure and environment on fatigue and fracture of materials. Composite materials

concepts and applications; Whiskers and fibres medical applications such as structures, orthopedic implants, artificial organs, dental materials. Biodegradable block copolymers and their applications for drug delivery

Unit II: Biomaterials And Implementation

Implementation problems - inflammation, rejection, corrosion, structural failure. Consists of biomaterial applications and tissue engineering for artificial organs, Types of biomaterials and their applications for the human body, Issues of biocompatibility and its evaluation, Surface characterization of biomaterials, biomaterial-blood (bio-fluid) interface, Surface modifications for improved compatibility.

Unit III: Biomaterials In Different Systems

Cardiovascular implant biomaterials: artificial heart valves, Mechanical and bio-prosthetic valves, materials used, criteria required for fulfillment of physiological functions, Vessel grafts, Endothelial cell seeding as a surface modification of biomaterials. Orthopaedic implant materials: temporary external fixators, Materials for reconstruction of cartilage. ligaments and tendons, Bone replacement and bone cement, Artificial joint replacement, prosthesis and orthotics. Ophthalmology: Artificial cornea, contact lenses, intra-ocular lenses, artificial aqueous and artificial vitreous humor, artificial tears, artificial tympanic membrane.

Unit IV: Applications Of Advanced Biomaterials

Skin replacements: Properties of skin, Wound dressings, artificial skin; facial implants: Dental implants: dental restorative materials, implanted dental interfaces, denture resins and cements; artificial red blood cells; artificial body fluid: artificial lung surfactants, artificial saliva, artificial synovial fluid; dialysis membranes, artificial liver, artificial pancreas; Artificial neural implants: materials used, criteria for selection and design. Conducting polymers and their applications in reconstruction and regeneration of neuronal, muscle and cardiac cells.

Reference Books:

1. Biomaterials: An Introduction, J. Park, R. S. Lakes, Springer publications, 3rd Ed.
2. An Introduction to Biomaterials, J. O. Hollinger, CRC Press, 2nd Ed.
3. Characterization and Development of Biosystems and Biomaterials, A. Oechsner, L. F. M. Silva, H. Altenbach, Springer Publications.
4. Advanced Biomaterials: Fundamentals, Processing and Applications, B. Basu, D. S.Katti, A. Kumar, Wiley Publications.
5. Advances in Biomaterials Science and Biomedical Applications, Edited by Pignatello R., Intech Publishers.
6. Biomaterials for Tissue Engineering Applications, J. A. Burdick, L. M. Robert, Springer Publications.

PT03EBMT01
Biodynamics

Unit I: Introduction To Fluid Mechanics

Fluid properties, basic laws governing conservation of mass momentum and energy; Laminar flow, Couette flow and Hagen-Poiseuille equation, turbulent flow. Bernoulli's equation and its clinical significance, Make up of blood vessels, Angiology, Compliance and Elastance, Wind Kessel Model, Flow dynamical study of circulatory system, heart and blood vessels, anatomy and physiological considerations; Components and functions of arterial and venous systems; Lymphatic system

Unit II: Dynamics Of Hard And Soft Tissues

Hard tissues: Bone structure and composition mechanical properties of bone, cortical and cancellous bones, viscoelastic properties, Maxwell and Voight models – anisotropy, Electrical properties of bone, fracture mechanism and crack propagation in bones, fracture fixators, repairing of bones, mechanical properties of collagen rich tissues, teeth and its properties. Soft tissues: Structure and functions of cartilages, tendons, ligaments, stress-strain relationship, soft tissue mechanics, mechanical testing of soft tissues standard sample preparation, cross-section measurement, clamping of the specimen, strain measurement, environmental control), time dependent properties of testing.

Unit III: Body Fluids And Their Motions

Flow of Newtonian and non-Newtonian fluids in rigid tubes, flexible tubes and collapsible tubes; Blood flow through arteries and veins; Holt and Conrads experimental investigations. Kinetic energy, flow, pressure-flow relations in vascular beds; Cardiac cycle; Cardiac valve dysfunctions; Blood pressure, regulation and controlling factors; Coronary circulation, heart failure. Left ventricle pressure- volume (P-V) relationship and P-V relationship in different valve diseases

Unit IV: Biomechanics Of Joints

Skeletal joints, skeletal muscles, basic considerations, basic assumption and limitations, forces and stresses in human joints, mechanics of the elbow, mechanics of shoulder, mechanics of spinal column, mechanics of hip, mechanics of knee, mechanics of ankle. Locomotion: Human locomotion, gait analysis and goniometry, Ergonomics, Foot Pressure measurements – Pedobarograph, Force platform, mechanics of foot. Total Hip Prosthesis: requirements, different types of components, Stress analysis and instrumentation, Knee Prosthesis.

Reference Books:

1. Biomechanics: Circulation, Y. C. Fung, Springer Verlag Publishers. 2nd Ed.
2. Biofluid mechanics in cardiovascular system, Lee W. McGrawhill Publishers.
3. Basic Biomechanics, S. J. Hall, WCB/McGraw Hill Publishers 3rd Ed.
4. Biomechanics of Medical Devices, D. N. Ghista, Macel Dekker.
5. Orthopaedic Mechanics, D. N. Ghista, Roaf, Academic Press.
6. Basic Orthopedic Biomechanics and Mechanobiology, V.C. Mow, W. C. Hayes, Lippincott, Raven publishers, 3rd Ed.

PT03EBMT02
Medical Sensors And Diagnostics And Clinical Pharmacology

Unit I: Sensors- Architecture and Classification

Electrodes as bioelectric transducers: The electrode-electrolyte interface; Specification and selection criteria for electrodes; Medically significant measurands, sensing methods for biological signals; Sensor characteristics: linearity, repeatability, hysteresis, drift; Sensor models in the time and frequency domains.

Unit II: Types Of Sensors

Sensors for physical measurands: strain, force, pressure, acceleration, flow, volume, temperature and biopotentials. Sensors for measurement of chemicals: potentiometric sensors, ion selective electrodes, ISFETS; Amperometric sensors, Clark Electrode; Catalytic biosensors, immunosensors

Unit III: Development Of Drug And Clinical Trials

Development of new drugs, protocol designing, phases, methodology and ethics of clinical trials, clinical pharmacokinetics and phramcodynamic studies, post marketing surveillance, therapeutic drug monitoring, pharmacovigilance, ADR monitoring, Drug information service, drug utilization studies, therapeutic audit, essential drug concept and rational prescribing, GLP and GMP. Recent advances in understanding of mechanism of drug action and treatment of diseases; new drugs and new uses of old drugs.

Unit IV: Definition and Scope Of Clinical Pharmacology

Introduction, Official regulation of medicines, Classification and naming of drugs; Drug therapy monitoring in special situations such as pediatric geriatric, pregnancy etc; Racial gender and ethnic differences in drugs response; Patient counseling and interviewing techniques, Improving patient compliance and patient monitoring.

Reference Books:

1. Bioinstrumentation, J. G. Webster, Wiley and Sons.
2. Handbook of Biomedical Instrumentation, R. S. Khandpur, Tata McGraw Hill Publication, 2nd Ed.
3. Introduction to Biomedical Equipment Technology, J. J. Carr, J. M. Brown, Prentice Hall Publications.
4. Principles of Medical Electronics and Biomedical Instrumentation, R. C. Rao, S. K. Guha, University Press.
5. Applied Biosensors, D. L. Wise, Butterworth.

PT03CBMT04

Experimental Methods- III (Any Eight of the following)

1. Mechanical characterization of polymeric biomaterials
2. Hardness testing of biomaterials
3. Estimation of haemocom
4. Patibility of biomaterials by hemolysis studies
5. Measurement of torque required to tap and screwing in jaw bone.
6. Determination of moment of inertia of human limb using dynamometer.
7. Measurement of viscosity of hydrogel (biopolymer)
8. Determination of moment of inertia of human bone using compound pendulum method.
9. Surface roughness measurement of biomaterials.
10. To evaluate hydrophilicity of biomaterials
11. Biofilm formation
12. Determination of molecular weight of polymer (Static Light Scattering)
13. Demonstration of different types of medical implants

References Books:

1. Biomedical Transducers And Instruments, T. Togawa, T.Tamora, P. Ake Oberg, CRC Press.
2. Transducers For Biomedical Measurements, R. S.C. Cobbold, John Wiley & Sons Inc.
3. Biomedical Sensors- Fundamentals And Applications, H. N. Norton, Noyes Publications.

PT03CBMT05

Experimental Methods- IV (Any Four of the following)

1. Measurement of galvanic skin resistance.
2. Measurement of heart sound using electronic stethoscope.
3. Determination pulmonary function using spirometer (using mechanical system).
4. Measurement of respiration rate using thermister /other electrodes.
5. Measurement of pulse rate using photoelectric transducer and pulse counting for known period.
6. Measurement of heart rate using F-V converter.
7. Measurement of blood pH.

References Books:

1. Handbook of Bio-Medical Instrumentation, R. S. Khandpur, Tata McGraw Hill Publishers
2. Medical Instrumentation: Application and Design, J. G. Webster, Wiley-India Edition

Defense Science and Technology

PT03CDT01

Composite Materials and Applications to Defence needs

Unit I : Introduction

Composite Materials definition and classification - Dispersion Strengthen Composites, Particulate Composites, Concretes, Laminar Composites and Introduction to Fiber Reinforced Composites. Reinforcements: Types of reinforcements-whiskers and fibers, preparation, structure and properties of different reinforcing fibers, carbon fibers, glass fibers, polymer fibers (Aramid, PU fibers etc.) and alumina fibers. Matrix systems: Ceramics and Carbon matrix system, polymer matrix systems - Fluoro Polymers, Epoxy Resins etc.

Unit II: Types of Composites

Fiber reinforced composites with different matrix systems, polymer matrix (thermoset and thermoplastic) composites e.g. Polyester glass fiber reinforced Laminates for Aircrafts With glass cloths, Chopped strand Mat, Needle Mat, Preforms etc., PEEK - C/graphite Thermoplastic Composites for Aircrafts and Missiles, High Temperature Ablative Composites - Specialty Polymers: Polyamide-imides and their composites with E-glass, S-glass, and C-fibers with PF and MF Resins, C-Fiber with epoxy resins, High Heat Resistant Thermoplastics Composites for for Aircrafts and Helicopters, metal matrix composites and ceramic matrix composites, C-C Composites, types of nanocomposites

Unit III: Fabrication Techniques and Test Procedures

Interfaces in composites and micromechanics of composites, molding processes for reinforced composites - Hand lay up technique, contact molding, transfer molding, pultrusion, filament winding, Fabrication of metal and ceramic matrix composites. Coating Techniques: Electrostatic Powder gun coating, Dipping Method, Electrochemical Deposition, Room Temp Curing with initiator catalysts, Test procedures for mechanical testing, physical properties, void content for fiber reinforced composites.

Unit IV: Properties and applications of composites

Mechanical properties of composite, effect of fiber volume content, orientation of fibers & void contents on mechanical properties of composites, fracture behavior of composites, thermal properties of composites, Applications of composites in Defense and Aerospace applications. Materials for LCAs, Rocket and Missile Structures, Nanocomposites for military and air warfare applications. Conducting Polymer Microwave Absorbing & ESD Protection Materials, Polymers for Electronic Applications, Photo resists, Polymers for Prosthetic Devices: Plysiloxanes, PVA, PET, Polycarbonates

Reference Books:

1. Composite Materials, K. K. Chawla, Springer
2. Handbook of composites, G. Lubin, Springer
3. Science and Engineering of Materials, Donald R. Askeland
4. An Introduction to Composites Materials by D. Hull, Cambridge
5. Engineering Materials, 1980, MF Ashby, Pergamon

PT03CDT02

Sensors and Devices

Unit I:

Importance of sensors in defense, Classification of sensors, Measurement standards
Gas sensors-classification, Indirect and Direct Techniques, electrochemical sensors, catalytic gas sensors, semiconductor gas sensors, ceramic, thick and thin film sensors, array of gas sensors, electronic nose
Fiber optic sensors (FOSs), Basic concepts, Architecture of Fiber Optic Sensors, Applications-Temperature, Humidity, Liquid level, Fluid flow and Microbend sensors, Fiber Optic Chemical Sensors, Distributed Sensing System using OTDR, Integrated Optics Sensors, Seismic Sensors

Unit II:

Resonating quartz sensors, Surface Acoustic Wave Sensors (SAW), SAW sensors operation – Chemical and Physical Sensors, Magnetic field sensors, Mechanical Sensors
Bio Sensors, Classification of Biosensors, Enzyme based biosensors, Electrodes for Electrochemical Biosensors, Optical Biosensors, SAW biosensors
Silicon Micromachining, Micro Electro Mechanical Sensors (MEMS), Si sensors and ASIC designing
Smart sensors, Bus Operated Sensing System, Intelligent sensing system

Unit III:
Introduction to wireless communication and Standards, Global Positioning Sensors (GPS), A brief history of navigation and positioning, Introduction to Early techniques in Positioning, Satellite based Navigation System, Non GNSS Positioning System, GNSS Positioning System, Military Applications of GIS, Integration of GPS with Remote Sensing and GIS
Wireless Sensor Networks (WSN) – Introduction and Overview, Applications of WSN, Examples of category 1 WSN Applications, Basic Wireless Sensor Technology

Unit IV:

Field- effect devices and their structures with working mechanisms, Submicron MOSFET, Multistage amplifiers: Analysis of multistage amplifiers, High frequency response of a CE stage, Analysis of difference amplifiers. Feedback amplifiers: Analysis and design of negative feedback amplifiers. Oscillators: Design and analysis of RC phase shift oscillator, Wein bridge oscillators, Hartley, Colpitts and Crystal oscillators. Power amplifiers, Design of heat sink, power output and

cross over distortion. Tuned amplifier: Single tuned and double tuned interstage design. Class B and class C tuned power amplifiers.

Reference Books:

1. Sensors for Domestic Applications, Alnado D'Amico and Giorgio Sbeveghen, World Scientific Co. (USA)
2. Sensors and Transducers (Second Edition), D. Patranabis, Prentice Hall india pvt. Ltd, New Delhi
3. Electronic Devices and Circuit- An Introduction, Allen Mottershead, pHi publication
4. Electronic Devices and Circuit Theory, Robert L. Boylestad, Louis Nashelsky, PEARSION
5. Advance in Biosensors, A. P. F. Turner, Jai Press Ltd., New Delhi
6. Optical Fiber communication, Gerd Kaiser , 4th Edition, TataMcGraw Hill, 2008.
7. Fiber optics in Telecommunications and sensor systems, S K Sarkar, S Chand & Co., New Delhi, 2002.
8. Optical Fiber Sensors, J P Dakin and B Culshaw , Vol. 1 & 2, Artech House, Boston and London, 1998.
9. Biosensors Principles & Applications, Loic J. Blum and Pierre R. Coulet, Marcel Dekker Inc (USA)
10. Millman and Halkias, Integrated Electronics, 2nd Edition, Tata Mcgraw Hill Education Private Limited, 2010.
11. Solid State Electronic Devices, Ben G.Streetman, 6th Edition, Prentice-Hall of India
12. Analysis and Design of Analog Integrated Circuits, Paul Gray and Meyer, 5th Edition, Wiley India, 2010.
13. Integrated Electronics, J. Millman and Halkias, 2nd Edition, TMH, 2010.
14. Micro Electronics, J. Millman and A.Grabel, 2nd Edition, TMH, 2009.
15. Global Positioning, Technologies and Performance, Nel Samama, Wiley Interscience, A john Willey and Sons Inc., Publication, 2008, ISBN 978-0-471-79376-2
16. Global Positioning System: Signals, Measurements, and Performance (Revised Second Edition), Pratap Misra, Per Enge, 2010
17. Introduction to GPS: the Global Positioning System, Ahmed El-Rabbany Artech House, Incorporated, 2006, ISBN 1-58053 – 183-1
18. Integration of GPS with Remote Sensing and GIS: Reality and Prospect, Jay Gao, Photogrammetric Enginbring & Remote Sensing, May 2002
19. Wireless Sensor Networks, Technology, Protocols and Applications, Kazem Sohraby, Daniel Minoli, Taieb Znati, Wiley Interscience, A john Willey and Sons Inc., Publication, 2007, ISBN 978-0-471-74300-2

PT03CDT03

Antenna Systems and Radars

Unit I:

Fundamental principles of antenna, Introduction of different types of antennas (wire, loop, arrays, Yagi-Uda, horn, parabolic, patch and broadband antennas) and their applications, Antenna radiation pattern, power density, and intensity, Antenna beamwidth, directivity, efficiency, gain, Antenna polarization, input impedance, effective aperture,

Unit II:

Friis transmission equation and radar range equation, Far-field radiation, RF propagation, ground effect, weather effect, RF safety, Dipole antennas, Loop antennas, Microstrip patch antennas, Antenna arrays, Antennas and wireless communication systems.

Unit III:

Radar and Radar Equation, Radar range, Doppler measurement, Block diagram and characteristics (Approaching & receiving targets) CW Radar, FM - CW radar, altimeter, Multiple Frequency Radar, Pulse Radar, Pulse Doppler Radar, Tracking Radar.

Unit IV:

RADAR System Design, Matched Filter, Detector Characteristics, Phased Arrays, Advantages and Limitations Navigational Aids.

Reference Books:

1. Introduction Radar Systems, M.I. Skolnik, McGraw Hill Book Co., Fourth Edition, 2001.
2. Radar Engineering and Fundamentals and Navigational Aids, G.S.N. Raju, I.K. International, 2008
3. Understanding Radar Systems, Simon Kingsley and Shaun Quegan, SciTech Publishing, 1999.
4. Introduction to Radar Systems, Merrill I. Skolnik, Tata McGraw Hill, 2001
5. Antenna and wave Propagation for wireless Communication Systems Simon Saunders, Alejandro Aragón-Zavala -Wiley Publications, ISBN: 978-0-470-84879-1, 546 pages, March 2007

PT03EDT01

Robotics and Manufacturing Systems

Unit I:

Robot definition: Robotic systems - Its role in automated manufacturing; robot anatomy; robot classifications and specifications. Robot kinematics, forward and reverse transformation, homogeneous transformations.

Robot actuators and control; Pneumatic, hydraulic and electrical drives and controls used in robots.

Unit II:

Robot end-effectors, mechanical, magnetic and vacuum grippers, gripping forces RCC and design features of grippers.Robot sensors, different types of contact and non-contact sensors; Robot vision and their interfaces; Robot languages and programming techniques.

Unit III:

Applications of robots in materials handling, machine loading/unloading, inspection, welding, spray painting and finish coating, and assembly, etc.

Economic performance and evaluation strategies, Robot installation and planning. Safety features.

Mobile Robots, Autonomous robots, intelligent robots

Unit IV:

Integrated automation, computers and managerial challenges; high speed machining, precision machining;

Nontraditional machining: EDM, ECM, USM, PAM, EBM, AJM, WJM, Explosive forming and LBM.

Graphics standards - CAD and CAE, Computer networking, GT concept, FMS, CAPP, CIM, Computer aided Quality Control, CMM, Application of AI in CAD/CAM/CIM., Rapid Prototyping and Tooling.

Reference Books:

1. Industrial Robotic Technology - Programming and Application, M.P.Groover, McGrawhill
2. Robotics for Engineers, Y.Koren, McGrawhill.
3. Robots Modelling Control and Applications with Software, P.G.Ranky and C.Y.Ho, Springer Verlag Berlin.
4. Robotics Technology and Flexible Automation, S.R.Deb, TMH.
5. Non-Conventional Machining, P.K.Mishra, Narosa Publishers.
6. Manufacturing Science, A.Ghosh, East-West Publications.
7. Non-Traditional Manufacturing, Benidict.
8. Non-Traditional Machining, Dr. A. Bhattacharya, The Institution of Engineers (Calcutta)
9. Automation, Production System & Computer Integrated Manufacturing, M.P. Groover, Pearson Education.
10. Advanced Machining Process, Vijay K. Jain Allied Publisher
11. Modern Machnning processes, Pandey P. C.and Shah H. S., Tata McGrow Hill
12. Industrial Robotics, Ganesh S. Hegde, Laxmi Publications.
13. Anatomy of a Robot, Charles Bergrea, McGrow Hill

PT03EDT02

Automation and Controls

Unit I:

Overview: Structure & components of Automation systems, Architectural level of controls
Classification of Control Systems: Open Loop, Closed Loop System, Applications
Control System Component: DC Servomotor, AC Servomotor, Hydraulic Actuator, Pneumatic Actuator, Types of Stepper motors

Unit II:

Controllers: Proportional, Proportional-Integral (PI), Proportional-Derivative (PD), Proportional-Integral–Derivative (PID), Tuning of P, PI, PD, PID, Cascade Control, Statistical Process Control, Optimal Control, Digital Controller, Distributed Control Systems

Unit III:

Interfaces & Communication: Analog, Digital, Standard interfaces, Serial transmission, Parallel transmission, Communication Management System, Local Area Networks

Unit IV:

Computer aided process control software: System software, Application software, System support software, Real time operating system
Applications: Temperature control, Thickness control**,** Position control, Speed control

Reference Books:

1. Principles of Control Systems, U. A. Bakshi, V. U. Bakshi, Technical Publication
2. Computer aided process control, S. K. Singh, pHi
3. Process Control Instrumentation, C. D. JOHNSON, pHi
4. Automatic Control System, B. C. KUO, pHi
5. Discrete Time Control System, K. OGATA, Pearson Education India
6. Programmable controllers: Principle and Applications, Webb J.W, pHi, New Delhi
7. Programmable Controllers: An Engineers' Guide, Parr A, Newnes, Butterworth Heinneman Ltd.
8. Process Control Handbook, Liptak B.G (ED) vol-2, Chilton book Co.
9. Handbook for Instrumentation Engineers, Noltinc.
10. Computer control of machines and processes, Bollinger J.G and Duffie N.A, Addison-Wesley.
11. Applied Instrumentation in Process Industries (Volume-IV), ANDREWS, Elsevier
12. Principles of Process Control, D. PATRANABIS, TMH

PT03CDT04

Experimental Methods III (Any Eight of the following)

1. To fabricate the glass fiber reinforced epoxy matrix composite by hand lay up technique.
2. To determine the theoretical fiber volume content of glass fiber reinforced epoxy matrix composite
3. To determine the actual fiber volume content of glass fiber reinforced epoxy matrix composite by acid digestion method.
4. To determine % apparent porosity of the composites.
5. To determine the flexural strength and ILSS of the composites by three points bend test on UTM.
6. Izod and Charpy Impact Testing of Materials
7. Rockwell or Bulk hardness testing of Materials
8. Thermal characterization of composites.
9. Micro structural studies of composites.
10. Non destructive Evaluation of Materials with Magnetic Particle Inspection
11. Non destructive Evaluation of Materials with Ultrasonic tester

PT03CDT05

Experimental Methods-IV

1. Studies on how one device can be used to manage, command, direct, or regulate the behavior of other System Open Loop control & Close Loop control.
   Scope of Studies of Control System Lab Kit.
   Study & observe/implement: **(Any Four)**
   i) Voltage to Frequency converter ii) Frequency to Voltage converter iii) Motor control and Light intensity control using PWM method iv) Characteristic of Photoconductive cell (LDR) v) Motor speed & input characteristics vi) Bidirectional Motor speed control vii) Tachogenerator using F/V converter viii) position control of DC Motor and Servo Motor ix) open and closed loop of Temperature control x) open and closed loop of Light intensity control xi) open and closed loop of DC motor control

2. Sensor Module: **(Any One)**
   a) Study of Temperature Sensor interface
   b) Temperature Pressure Transduce interface

3. Understanding the RADAR: **(Any One)**
   a) To understand the theoretical and experimental concepts of microwave technology devices and circuits.
   b) Studies on CW Doppler and Pulse RADAR through application simulation software.

c) Studies on Moving Target Indicator RADAR and RADAR Calculator using simulation software.

4. Robotic Arm: **(Any One)**
   a) Study of Stepper motor, Servo motor, DC Motor and feedback control system
   b) Programming of Robotic Arm

5. Study of Antenna characteristics: I-V characteristics of gun diode.

Earth System Science

PT03CESS01

Geophysics

Unit I :

The dynamic Earth -Gravity, the figure of the Earth and geodynamics -The Earth's rotation, Gravity anomalies and its Interpretation. Earth's age, thermal and electrical properties- Geochronology, Geoelectricity Geomagnetism and paleomagnetism - The physics of magnetism, Rock magnetism, Geomagnetism, Magnetic surveying, Paleomagnetism , Geomagnetic polarity.

Unit II :

Plate Tectonics and Geodynamics- Seismology and the internal structure of the Earth - Elasticity theory, Seismic waves , The seismograph , Earthquake seismology, Seismic wave propagation , Internal structure of the Earth, Vine-Mathews hypothesis, Marine magnetic anomalies, sea floor spreading, mid-oceanic ridges and geodynamics, Plate boundaries and seismicity, Heat flow mechnisms, Core-Mantle convection and Mantle plumes.

Unit III :

Earth's upper atmosphere, ionosphere, plasmasphere, Geomagnetic field, magnetosphere and its implications, Van Allen radiation belts. Vertical structure of ionosphere, number density and processes of atomic-molecular constituents, properties of ionosphere, day-night differences.
Earth-Sun interactions - Space phenomena, solar corona, solar wind and flares, coronal mass ejections, interactions with magnetosphere, geomagnetic storms. Auroral phenomena, ionospheric currents, Radio wave propagation and communications, space radiation protection, Heating of neutral atmosphere, solar and other radiation effects on stratosphere

Unit IV:

Depth of penetration of electromagnetic fields, Detection of electromagnetic fields, Tilt-angle methods, Tilt-angle methods employing local transmitters, The VLF method, The AFMAG method, Phase measuring systems, Time-domain electromagnetic surveying, Non-contacting conductivity measurement, Airborne electromagnetic surveying, Fixed separation systems, Quadrature systems, Interpretation of electromagnetic data, Limitations of the electromagnetic method,

Telluric and magnetotelluric field methods- Surveying with telluric currents, Magnetotelluric surveying, Ground-penetrating radar, Applications of electromagnetic surveying.

Reference Books:

1. Fundamentals of Geophysics, William Lowriei, Cambridge University Press, 2nd Ed.
2. Space Physics, V. Bothmer and I. Dagliz, Springer
3. An Introduction to Geophysical Exploration, Philip Kearey, Michael Brooks and Ian Hill, Wiley-Blackwell; 3rd Ed.
4. Outlines of Geophysical Prospecting - A manual for Geologists, Ramachandra Rao, M.B. Prasaranga, University of Mysore.
5. An Introduction to Geophysical Prospecting, M.B. Oobrin, and C.H. Savit, McGraw-Hill Inc., US, 4th Ed.
6. Applied Geophysics, W. M. Telford, L. P. Geldart, R. E. Sheriff, Cambridge University Press, 2nd Ed.
7. The Solar-Terrestrial Environment - An Introduction to Geospace, J. K. Hargreaves, Cambridge University press.
8. Introduction to Space Physics, M. G. Kivelson, C. G. Russell, Cambridge University press
9. Sun, Earth and Sky, Kenneth R. Lang, Springer-Verlag Berlin Heidelberg GmbH

PT03CESS02

Geochemistry

Unit I:

Aquatic Chemistry - Acid-Base, Complexation, Dissolution and Precipitation Reactions (example related with Silicates and Minerals) , Clays- Surface Chemistry and Charges, Trace Elements in Igneous Processes- Behavior of the Elements and their Distribution of Trace, Partition and Crystal-Field Effects.

Unit II:

Radiogenic Isotope Geochemistry – Basics, Geochronology, Decay, Cosmogenic and Fossil Isotopes (Applications) Stable Isotope Geochemistry- Scope, Theoretical Considerations Fractionation (in hydrological, Biological and Hydrothermal System) Isotopes of Boron and Lithium.

Unit III:

Cosmochemistry - The Polygenetic Hypothesis, Nucleosynthesis in Stellar Interiors, Explosive and Interstellar Space. Meteorites: Chondrites, Differentiated Meteorites, Meteorite Mineralogy, Relationships among Meteorites and Meteorite Parent-Bodies, Isotopic composition of the Solar System, Origin of Meteorites, Formation of the Solar System, Formation of Chondritic Meteorites and Processes in the Solar Nebula, Formation of the Planets, The Moon: Its Chemistry and History.

Unit IV:

Minerals and Rocks: Forms of minerals, Crystal forms and systems, Morphological relationship of crystals, Feature for identifying minerals, Basics components of crust, Igneous rocks, Grain growth and texture, Composition and classification of Igneous rocks, Description and common igneous rocks, Sedimentary rocks- Formation of layering in sedimentary rocks, Description and common Sedimentary rocks, Factors controlling metamorphism, Type and concept of metamorphism, Influences of fluids in metamorphism, metamorphism rocks.

Reference Books:

1. Geochemistry , W.M.White, Wiley-Blackwell
2. Stable Isotopes and Biosphere- Atmosphere Interactions, Lawrence B. Flangan, James R. Ehleringer and Diane E. Pataki, Elsevier Academic Press.
3. Principles of Isotope Geology, G. Faure, Wiley, 2nd Edition.
4. Principles and Applications of Geochemistry, G. Faure, Prentice- Hall, New Jersey
5. Fundamentals of Geology, A.B. Roy, Narosha publishing house, New Delhi
6. Foundation of Geology, S.B. Bhagwat, Global vision publishing house, New Delhi.
7. Petrology, Walter T. Huang, McGraw-Hill, New York

PT03CESS03

Climate Dynamics and Earth System Interactions

Unit I:

Atmosphere: Geometry and Chemical composition, Physical properties of air, Global energy balance - Planetary emission temperature, Atmospheric absorption spectrum, Green house effect, Vertical structure of the atmosphere, Temperature and greenhouse gases. The relationship between pressure and density, hydrostatic balance, Vertical structure of pressure and density, The nature of convection, Convection in water, Dry convection in a compressible atmosphere, The atmosphere under stable conditions, Moist convection, Convection in the atmosphere, Radiative-convective equilibrium.

Unit II:

The meridional structure of the atmosphere- Radiative forcing and temperature, Pressure and geopotential height, Moisture and winds. The equations of fluid motion-Differentiation following the motion, Equation of motion for a nonrotating fluid, Conservation of mass, Integration, boundary conditions, and restrictions in application, Equations of motion for a rotating fluid. Balanced flow-Geostrophic motion, The Taylor-Proudman theorem, The thermal wind equation, Subgeostrophic flow: the Ekman layer.

Unit III:

The general circulation of the atmosphere: Circulation, A mechanistic view of the circulation, Energetics of the thermal wind equation, Large-scale atmospheric energy and momentum

budget, Latitudinal variations of climate. Ocean and its circulation-Physical characteristics of the ocean, Inferences from geotropic and hydrostatic balance, Ocean eddies. The wind-driven circulation-The wind stress and Ekman layers, Response of the interior ocean to Ekman pumping, Interior balances, Depth-integrated circulation: Sverdrup theory, Effects of stratification and topography, Baroclinic instability in the ocean.

Unit IV:

The thermohaline circulation of the ocean: Air-sea fluxes and surface property distributions, Observed and Dynamical models thermohaline circulation, Observations of abyssal ocean circulation, The ocean heat budget and transport, Freshwater transport by the ocean. Climate and climate variability-The ocean as a buffer of temperature change, Southern Oscillation, Paleoclimate. Mathematical and physical structure of Climate models- Hierarchy of Climate models, general circulation models.

Reference Books:

1. Atmosphere, Ocean and Climate Dynamics: An Introductory, John Marshall and R. Alan Plumb, Elsevier Academic Press.
2. An Introduction to Dynamic Meteorology, James R Holton, Academic Press.
3. Physics of Climate, Jose P. Peixoto, Abraham H. Oort, American Institute of Physics
4. Global Physical Climatology, Dennis L. Hartmann , Academic press.
5. Atmosphere-Ocean dynamics, A E Gill, Academic press.
6. Dynamical Paleoclimatology: Generalized Theory of Global Climate Change B. Saltzman, Academic press.
7. James R Holton, 'An Introduction to Dynamic meteorology' 2004, 4th Ed. Academic Press.

PT03EESS01

Remote Sensing, GPS, Earth Resources and Future Energy Options

Unit I:

Principles of Remote Sensing, Electromagnetic Radiation, Interaction of EMR with the Atmosphere, Image resolution – special, radiometric, spectral resolution, Spectral Signatures, Vegetation, Satellite data formats and standards, Platforms and sensors- Satellite orbital characteristics, Geostationary Satellite, Sun-synchronous Satellite, Image characteristics, LANDSAT Series, Indian Remote Sensing Satellite (IRS) series- IRS and Others, Sensors- Sensor parameters, Microwave Remote Sensing, Thermal Remote Sensing, thermal properties of materials, MODIS: Moderate Resolution imaging spectro-radiometer and applications.

Unit II :

Global Position System – NAVSTAR, GPS basics, GPS signals, Satellite Ranging- Absolute and Differential positioning, Errors in GPS data- Noise, international errors, other sources of errors, GLONASS, GALILEO, COMPASS, WAEE, GNSS, GPS in India, GPS Traversing, GPS applications.

Geographic Information System- Definitions of GIS, CAD verses GIS, GIS applications in India. Components of GIS, Software of GIS- Data standards and metadata.

Unit III :

Earth Resources: Land – Its use and Management – Land a resource, Spheres of land management, Land Capability and mapping, Human settlements and land use, Soil- Nature of Soil, Origin of soils, Classification of Soils, Soil types of India, Microclimate modifications, Soil conservation, Water - Water recourses of India, Nature of Ground water, Favourable geological conditions, Recharge of ground water, Springs in the hills, Quality of water, Water management

Unit IV :

Renewable Sources of Energy – The energy crisis, Energy option, Energy from solar Radiation, Harnessing the wind, Energy from tides and waves, Thermal and salinity gradients in sea water, Tapping geothermal energy, Energy from biomass, alternative Fuel, Nuclear energy option.

Reference Books:

1. Concepts and Techniques of Geo-informatics, Masood A. Siddiqui, Sharada Pustak Bhavan.
2. Remote Sensing and Image Interpretation, Lillesand, Kiefer, Chipman, Wiley India Publication, 6th Edition.
3. Remote Sensing, GIS and Wetland Management, Millea cooke, Random Publications, New Delhi.
4. Environmental Geology Ecology, Resource and Hazard management, K. S. Valadiya, McGraw Hill Education (India) private Ltd, 2nd Edition,
5. Geosciences, Environment and Man, H. Chamley, Elsevier Science.
6. Earthquake and Natural Disasters, Manik Kar, EBH Publishers.

PT03EESS02

Geo-Informatics, GPS, Natural and Manmade Hazards and Global warming

Unit I:

Geo informatics applications in Water and Land Resources: Water, Hydrology, Hydrogeology, Geohydrology, Hydrologic cycle, and their equations, Evaporation, Transpiration, Formation and Measurement of precipitation.
Groundwater problems related to foundation work, mining, canals, dams reservoirs and tunnels Problems of overexploitation and ground water mining.
Instruments for measuring gravity on land, Magnetic surveys on land, Equipment for land surveys: Surface energy sources, Geophones, Amplifiers, Analog data recording, Digital recording, important Remote Sensing Satellites- LANDSAT

Unit II:

Global Position System – NAVSTAR, GPS basics, signals, control segment, Absolute and Differential positioning, Errors in GPS data- Noise, international errors, other sources of errors, GLONASS, GALILEO, COMPASS, WAEE, GNSS, GPS in India, GPS Traversing, GPS applications. Geographic Information System- Definitions of GIS, CAD verses GIS, GIS applications in India. Components of GIS, Software of GIS, Proprietary file formats, Data standards, metadata.

Unit III:

Natural Hazards: Earthquakes and Seismic Hazards – Origin, Severity and effect of Earthquakes, Stability of structure and risk evaluation, Seismicity Condition in India, Spatial and Temporal Gaps in seismicity, Coping with Seismic Hazards, Instability of Hill-slopes and Landslides – Destabilizing forces and Mass movements, Identification of Land slide zone, Controlling land-slides, Floods-causes of floods, floods hazards in India, Management of floods. Cyclones and Tsunamis - Hazards on Indian coasts, Cyclone and their genesis, Tsunamis and Dimension of hazards.

Unit IV:

Pollution, Waste management and Global warming: pollution, ground water contamination, Pollution of River Waters, Pollution from mining activities, Contamination of lake water, pollution of marine water, Treatment of polluted water, Nature and effects of air pollution, Disposal of solids wastes, Noise as factor in pollution. Global Warming and climate change – Inevitable warming, Impact of global warming, Urbanization and climate of cites

Reference Books:

1. Concepts and Techniques of Geo-informatics, Masood A. Siddiqui, Sharada Pustak Bhavan.
2. Remote Sensing and Image Interpretation, Lillesand, Kiefer, Chipman, Wiley India Publication, 6th Edition.
3. Remote Sensing, GIS and Wetland Management, Millea Cooke, Random Publications, New Delhi.
4. Environmental Geology Ecology, Resource and Hazard management, K. S. Valadiya McGraw Hill Education (India) private Ltd, 2nd Edition,
5. Geosciences, Environment and Man, H. Chamley, Elsevier Science.
6. Earthquake and Natural Disasters, Manik Kar, EBH Publishers.

Practicals (Experimental Methods-III) (Any eight of the following)

1. Study of elements of symmetry of normal classes of crystal systems
2. To study the relationship between planes and directions in crystals on a 2D piece of paper using Stereographic projection technique
3. A lab involving XRD diffraction of a powder sample to be run by students themselves and indexing of the diffraction pattern
4. Study of physical properties of minerals in hand specimen

5. Study of optical identification of common rock forming minerals
6. Megascopic and microscopic study (textural and mineralogical) of the igneous rocks
7. Identification of minerals with chemical and crystallographic data and use of associated softwares
8. Study of the characteristics of klystron tube and determine the electronic tuning range and also study the communications by using microwave bench
9. To study the V-I characteristic of Gunn Diode
10. The electromagnetic Spectrum –to identify the relationship between wavelength and energy within the electromagnetic spectrum.
11. Motion of the moon & Life cycle of Stars – to learn about the shape, location and rate movement of the Moons apparent path
12. Sea Floor Spreading – using the age and positions of rock formations associated with the Mid-Atlantic Ridge to support the hypothesis of sea floor spreading

Practicals (Experimental Methods-IV) (Any eight of the following)

1. Determine the aerosol optical depth (AOD) and compare with satellite data.
2. Measure the solar irradiance data at 500 nm wavelength using Sunphotometer, compute the aerosol optical depth using Beer Lambert law and compare the AOD data with MODIS satellite
3. Determine the angstrom exponent from the spectral aerosol optical depth. Measure the solar irradiance data at different wavelengths using Sunphotometer, compute the aerosol optical depth using Beer Lambert law, and determine the angstrom exponent for inferring aerosol size information
4. Exercise on plotting of major earthquake zones of the world Fault plane solution and characterization of earthquakes
5. To find out dissolved Oxygen in the different water samples.
6. Biological Oxygen Demand –Using the To identify the relationship between the dissolved oxygen in the water and its ability to support aquatic life
7. Exercise on different concentrations of metal salts using spectrophotometer.
8. Introduction to different instruments related to seismic studies
9. Deciphering of hydro geological boundaries on water table contour maps
10. Angle of isolations – to identify the relationship between temperature and angle of insolation and how this effect the seasons
11. Problems on radial flow to a well in confined and unconfined aquifers
12. Interpretation of geologic structures from surface geological maps and reconstruction of structural developments through different time planes
13. Atmospheric Pressure and Temperature- To identify the relationship between atmospheric temperature and pressure near surface of the Earth
14. Using the math skills to analyze data about the planets in the solar system
15. Biomes of the World – To identify the locations, climate characteristics and productivity associated with the major biomes of the world

Reference Books:

1. Lab manual: Science of Earth Systems, Stephen D. Butz, Thomoson Delmar Learning

2. Vogel's, Textbook of Quantitative Chemical Analysis, J Mendham, R. C. Denney, J. D. Barnes, M. J. K. Thomas, Pearson Education
3. Exercises in Sedimentology, Gerald M. Friedman and Kenneth G. Johnson. Wiley, New York
4. A Practical Approach to Sedimentology, Roy Lindhome, The George Washington University , Washington.