



SARDAR VALLABHBHAI NATIONAL INSTITUTE OF  
TECHNOLOGY, SURAT

SVNIT

No: Dean (Acad.)/IAAC/1097/2023-24

Date: 23/10/2023

**The minutes of the 64<sup>th</sup> meeting of the Institute Academic Advisory Committee (IAAC)**

The aforesaid meeting was held on 9<sup>th</sup> October 2023, 03:30 pm onwards in the Institute Conference room, first floor, Administrative Building. The following members attended the IAAC meeting.

Sr. No.	Name	Designation
1	Dr. Anupam Shukla	Director, <i>Chairman</i>
2	Dr. Pramod Mathur	Registrar
3	Dr. Ravi Kant	Dean (Students' Welfare)
4	Dr. R. A. Christian	Head, Department of Civil Engineering
5	Dr. M. Chakraborty	Head, Department of Chemical Engineering
6	Dr. M.A. Zaveri	Head, Department of Computer Science and Engineering & Artificial Intelligence
7	Dr. A. K. Panchal	Head, Department of Electrical Engineering
8	Dr. R.N. Dhavse	In-charge Head, Department of Electronics Engineering
9	Dr. A.A. Shaikh	Head, Department of Mechanical Engineering
10	Dr. V.H. Pradhan	Head, Department of Mathematics & In-charge Head, Department of Physics
11	Dr. K.P. Desai	Head, Department of Humanities & Social Sciences and Management Studies In-charge Head, Department of Chemistry
12	Dr. R.K. Jana	Associate Dean (Academic)
13	Dr. V.K. Patel	Associate Dean (Academic)
14	Dr. N. D. Jariwala	Associate Dean (Research and Consultancy)
15	Dr. M.K. Rathod	Associate Dean (Research and Consultancy)
16	Dr. H. R. Jariwala	Dean (Academic), <i>Member-Secretary</i>

**Invitee(s)**

1	Shri Amit C. Patel	In-Charge Deputy Registrar (Academic)
2	Ayushman Tiwari	Students' General Secretary
3	Jujhar Singh	Academic Affairs Secretary (AAS)
4	Riya Shah	Research Innovation Affairs Secretary

The following members could not attend the meeting.

Sr. No.	Name	Designation
1	Dr. D.C. Jinwala	Dean (Research and Consultancy)



Sr. No.	Name	Designation
2	Dr. C.D. Modhera	Dean (Faculty Welfare)
3	Dr. S.S. Arkatkar	Dean (Planning and Development)
4	Dr. U.D. Dalal	Dean (Alumni & Resources Generation)
5	Dr. Sushil Kumar	Associate Dean (Faculty Welfare)
6	Dr. B. Kondraivendhan	Associate Dean (Faculty Welfare)
7	Dr. Y.D. Patil	Associate Dean (Planning and Development)
8	Dr. S. R. Arya	Associate Dean (Planning and Development)
9	Dr. P. N. Patel	Associate Dean (Research and Consultancy)
10	Dr. H.K. Dave	Associate Dean (Alumni & Resource Generation)
11	Dr. B. Dholakiya	Associate Dean (Alumni & Resource Generation)
12	Dr. S.R. Patel	Associate Dean (Students' Welfare)
13	Dr. S.N. Shah	Associate Dean (Students' Welfare)

At the outset, the Chairman IAAC warmly welcomed newly elected student representative Students' Ayushman Tiwari (General Secretary), Jujhar Singh (Academic Affairs Secretary (AAS)) and Riya shah (Research Innovation Affairs Secretary).

Item No.	Agenda Item	Remarks
<b>Item 64.1</b>	About an 'addition' of External Co-supervisor Dr. Sunil Kumar, Scientist-F and Head, Waste Re-Processing Division, CSIR-NEERI, Nagpur for PhD Student Mr. Abhay Kumar enrolled in the FIR category (DS21CE007) currently working under the supervision of Dr. K.D. Yadav (Res. 57.1 of the 57 <sup>th</sup> meeting of the DAAC held on 20/07/2023). A consent letter of Dr. Sunil Kumar is submitted with the DAAC recommendation.	Academic Regulation for Doctoral Programme (2023-24) 6.5.1(3)
<b>Reso. 64.1</b>	Approved as per Academic Regulation for Doctoral Programme (2023-24) 6.5.1(3)	
<b>Item 64.2</b>	To consider the request received from Dr. C.H. Solanki to change the Internal Examiner from Dr. Ankesh Kumar (Joined IIT Palakkad) to Dr. Shruti J Shukla, Assistant Professor, DoCE for Ph.D. student Ms. Bhoomi Kamdar (DS19CE021), FIR category (Reso. 57.2 of the 57 <sup>th</sup> meeting of the DAAC held on 20/7/23).	
<b>Reso. 64.2</b>	Dr. Ankesh Kumar, DoCE has joined the IIT Palakkad. Hence the recommendation of DAAC, DoCE category (Reso. 57.2 of the 57 <sup>th</sup> meeting of the DAAC held on 20/7/23). to replace him by Dr. Shruti J Shukla, Assistant Professor, DoCE as Internal examiner for the Ph.D. student Ms. Bhoomi Kamdar (DS19CE021) is recommended for Senate approval.	
<b>Item 64.3</b>	To consider a request from Ph.D. student Pandya Alpesh A. (D16AM008). PEC category under the supervision of Dr. A.K. Desai, Professor, DoCE for 6 months extension for Pre synopsis and thesis submission as 7 years of Ph.D. is getting over in July 2023. He has 04 papers accepted/published in Scopus indexed journal. As a government service, during COVID-19, he was assigned different duties. His research area is related to field works and hence	Academic Regulation for Doctoral Programme (2023-24)



	he was unable to do any major field work during COVID-19 (Reso. 57.4 of the 57 <sup>th</sup> meeting of the DAAC held on 20/7/23)	14.6.1.3 (1)
<b>Reso. 64.3</b>	The student has completed seven and years in July 2023. However, he has fulfilled the academic requirement. Hence, looking to his progress, the extension upto 31 <sup>st</sup> December, 2023 is recommended for the approval of the Senate as a special case. The student is advised to submit the thesis well within the extended period.	
<b>Item 64.4</b>	To consider a request from Ph.D. student J H Gabra (D16AM011), PEC category under the supervision of Dr. A.K. Desai, Professor, DoCE for 6 months extension for Pre synopsis and thesis submission as 7 years of Ph.D. is getting over in July 2023. He has 01 paper published in Scopus indexed journal and 04 papers are under review. During COVID-19, he was assigned different duties by the Collector. He and his family got COVID positive (third wave) in February 2022. (Reso. 57.5 of the 57 <sup>th</sup> meeting of the DAAC held on 20/7/23)	Academic Regulation for Doctoral Programme (2023-24) 14.6.1.3 (1)
<b>Reso. 64.4</b>	The student has completed seven years in July 2023. However, looking to his progress, the extension upto 31 <sup>st</sup> December, 2023 is recommended for the approval of the Senate as a special case. The student is advised to submit the thesis well within the extended period.	
<b>Item 64.5</b>	To consider a request of Ph.D student Pragya Verma (DS20CE013) enrolled in FIR category to change supervisor from Dr. K.A. Chauhan, Professor, DoCE to Dr. Chetan R. Patel, (Supervisor) Assistant Professor, DoCE and Dr. S.S. Arkatkar, (Co-supervisor) Associate Professor, DoCE (Res. 57.1 of the 57 <sup>th</sup> meeting of the DAAC held on 20/07/2023). Student has completed her coursework credits requirement. A consent letter of Dr. K.A. Chauhan is submitted with the DAAC recommendation.	Academic Regulation for Doctoral Programme (2023-24) 6.5.1(3)
<b>Reso. 64.5</b>	The request is approved.	
<b>Item 64.6</b>	A request of Ph.D. student Himanshu Gajera (DS19CO001), working under the supervision of Dr. M.A. Zaveri, for the category conversion from the FIR to PEC (resolution no. 2 of the DAAC held on 18/07/2023). The student has submitted 'No Objection Certificate' from the Employers with the recommendations. (Joined Pandit Deendayal Energy University, Gandhinagar on 20/7/2023 as Adhoc faculty)	Academic Regulation for Doctoral Programme (2023-24) 6.5.6 (b)
<b>Reso. 64.6</b>	The request is approved.	
<b>Item 64.7</b>	A request of Ph.D. student Matharani Kinnariben Chetankumar (DS18EL007), working under the supervision of Dr. H.R. Jariwala, for the category conversion from the FIR to PEC (resolution no. 1 of the 72 <sup>nd</sup> meeting of the DAAC held on 22/09/2023). The student has submitted 'No Objection Certificate' from the Employers with the recommendations. (Joined Continuum Associate as Power System Engineer on 12/7/2023)	Academic Regulation for Doctoral Programme (2023-24) 6.5.6 (b)
<b>Reso. 64.7</b>	The request is approved.	
<b>Item 64.8</b>	To consider the recommendation of the DAAC for the change in supervisor of the following Ph.D. and M.Tech. students as Dr. Rahul Radhakrishnan left the Institute on 03/08/2023. (resolution no. 2 of the 72 <sup>nd</sup> meeting of the DAAC held on 22/09/2023).	Academic Regulation for Doctoral Programme (2023-24) 6.5.1(3)



	Students' Name	Reg. No.	Existing Supervisor	Proposed Supervisor	
	Asfia Jawediqbal Urooj (FIR)	DS19EL006	Dr. R. Radhakrishnan	Dr. S.N. Sharma Dr. R. Radhakrishnan	
	Soni Sneha Kalpesh Kumar (PEC)	D20EL012	Dr. R. Radhakrishnan Dr. S.N. Sharma	Dr. S.N. Sharma Dr. R. Radhakrishnan	
	Avanesh Kumar (FIR)	D23EL002	Dr. R. Radhakrishnan	Dr. H.G. Patel Dr. R. Radhakrishnan	
	Ajay Kumar Singh (FIR)	D22EL003	Dr. R. Radhakrishnan Dr. G. Sushnigdha	Dr. S.N. Sharma	
	Suparna Chaulya	P22IC003	Dr. R. Radhakrishnan	Dr. H.G. Patel	
	Rathod Riya Anilbhai	P22IC007	Dr. R. Radhakrishnan	Dr. G. Sushnigdha	
<b>Reso. 64.8</b>	The recommendation of the DAAC, DoEE for the change in supervisor of the above Ph.D. and M.Tech. students of Dr. Rahul Radhakrishnan, who left the Institute on 03/08/2023 (resolution no. 2 of the 72 <sup>nd</sup> meeting of the DAAC held on 22/09/2023) is approved. The total number of FIR students of Prof. S. N. Sharma and Dr. H.G. Patel are within limit.				Academic Regulation for Doctoral Programme (2023-24) 6.5.1(3)
<b>Item 64.9</b>	To consider proposed courses for vocational training by Department of Electrical Engineering as per NEP. (resolution no. 3 of the 72 <sup>nd</sup> meeting of the DAAC held on 22/09/2023). ( <b>Annexure-I</b> )				
<b>Reso. 64.9</b>	Department of Electrical Engineering has proposed the syllabus of Vocational Training and recommended for the approval of the Senate.				
<b>Item 64.10</b>	To consider proposed courses for vocational training by Department of Electronics and Communication Engineering. (Res. 1 of the 80 <sup>th</sup> meeting of the DAAC held on 07/08/2023) ( <b>Annexure -II</b> )				
<b>Reso. 64.10</b>	Department of Electronics and Communication Engineering has proposed the syllabus of Vocational Training which has been recommended for the approval of the Senate.				
<b>Item 64.11</b>	To consider proposed courses for vocational training in 2 <sup>nd</sup> , 3 <sup>rd</sup> and final year by Department of Mechanical Engineering. (Res. 71.2 of the 71 <sup>st</sup> meeting of the DAAC held on 21/07/2023) ( <b>Annexure -III</b> )				
<b>Reso. 64.11</b>	Department of Mechanical Engineering has proposed vocational training in 2 <sup>nd</sup> , 3 <sup>rd</sup> and final year. They are recommended for the approval of the Senate.				
<b>Item 64.12</b>	To consider a request of Ph.D. student Priyanka P. Dave (D16ME009) enrolled in PEC category, working under the supervision of Dr. J.K. Parikh and Dr. S.A. Channiwala for 6 months extension of thesis submission. (Res. 71.5 of the 71 <sup>st</sup> meeting of the DAAC held on 21/07/2023). Two journal research papers have been published.				Academic Regulation for Doctoral Programme (2023-24) 14.6.1.1 (3)
<b>Reso. 64.12</b>	The student has completed the seven-year duration in July 2023. However, looking to her progress, the extension upto 31st December, 2023 is recommended for the approval of the Senate as a special case. The student is				



	advised to submit the thesis well within the extended period.	
<b>Item 64.13</b>	To consider a request of Ph.D. student Ketan D. Panchal (D16ME006) enrolled in PEC category, working under the supervision of Dr. A.A. Shaikh for 6 months extension of thesis submission. (Res. 71.7(i) of the 71 <sup>st</sup> meeting of the DAAC held on 21/07/2023). Two journal research papers and one patent has been published. Pre-synopsis seminar delivered on 19/7/23.	Academic Regulation for Doctoral Programme (2023-24) 14.6.1.1 (3)
<b>Reso. 64.13</b>	The student has completed the seven year duration in July 2023. However, looking to her progress, the extension upto 31 <sup>st</sup> December, 2023 is recommended for the approval of the Senate as a special case. The student is advised to submit the thesis well within the extended period.	
<b>Item 64.14</b>	A request of Ph.D. student Nishant M. Shah (D18ME004) enrolled in FIR category, working under the supervision of Prof. J. Banerjee, for the category conversion from the FIR to FPS (Res. 71.7(ii) of the 71 <sup>st</sup> meeting of the DAAC held on 21/07/2023). He has completed 5 years on 15/7/2023 so stipend period completed. He was selected as JRF for the project funded by GUJCOST attached with DAAC recommendation.	Academic Regulation for Doctoral Programme (2023-24) 6.5.6 (b)
<b>Reso. 64.14</b>	Approved as per Academic Regulation for Doctoral Programme (2023-24) 6.5.6 (b)	
	To consider the recommendations of DAAC, Department of Mathematics	
<b>Item 64.15</b>	A request of Ph.D. student Bhagya Shree Meena (DS19MA006) enrolled in FRS category, working under the supervision of Dr. Sushil Kumar, for the category conversion from the FRS to PEC (Res. 3.2 of the 3 <sup>rd</sup> meeting of the DAAC of Department of Mathematics held on 07/08/2023). The student has submitted 'No Objection Certificate' from the Employers with the DAAC recommendations. (Joined ICFAI University, Jaipur as Assistant Professor).	Academic Regulation for Doctoral Programme (2023-24) 6.5.6 (a & c)
<b>Reso. 64.15</b>	The request is approved.	
<b>64.16</b>	To consider proposed courses for vocational training by Department of Mathematics. (Res. 3.4 of the 3 <sup>rd</sup> meeting of the DAAC held on 07/08/2023) (Annexure –IV)	
<b>Reso. 64.16</b>	Department of Mathematics has proposed the syllabus of Vocational Training which has been recommended for the approval of the Senate.	
<b>Item 64.17</b>	To consider and approved the syllabus of MA-XXX "Research Methodology for Mathematics" as the Department of Mathematics course for Ph.D. students from the Academic Year 2023-24. (Res. 3.5 of 3 <sup>rd</sup> meeting of the DAAC held on 07/08/2023) (Annexure-V)	
<b>Reso. 64.17</b>	Department of Mathematics has proposed the syllabus of the course "Research Methodology for Mathematics" which has been recommended for the approval of the Senate.	
<b>Item 64.18</b>	A request of Ph.D. student Divya Jaiveer Singh (DS22CY005), working under the supervision of Dr. Ritambhara Jangir in the SERB, New Delhi, for the category conversion from the FPS to FIR (Res. 2 of the 117 <sup>th</sup> meeting of the DAAC held on 10/07/2023). GATE Scorecard attached with DAAC recommendation.	63 <sup>rd</sup> meeting of IAAC held on 7/7/2023 Reso. 63.2 & Reg. no 11.3 (d) July-2019



<b>Reso. 64.18</b>	The request is not approved.	
<b>Item 64.19</b>	About an 'addition' of Co-supervisor Dr. Sarita Kalla, Assistant Professor DoC for PhD Student Divya Jaiveer Singh (DS22CY005) enrolled in the FPS category currently working under the supervision of Dr. Ritambhara Jangir (Res. 2 of the 117 <sup>th</sup> meeting of the DAAC held on 10/07/2023). A consent letter of Dr. Sarita Kalla is submitted with the DAAC recommendation.	Academic Regulation for Doctoral Programme (2023-24) 6.5.1(3)
<b>Reso. 64.19</b>	The request is approved.	
<b>Item 64.20</b>	To consider and approve the syllabus of CY505 "Research Methodology for Chemistry" as the Department of Chemistry course for Ph.D. students from the Academic Year 2023-24. (Res. 3 of the 117 <sup>th</sup> meeting of the DAAC held on 10/07/2023) (Annexure-VI)	
<b>Reso. 64.20</b>	Department of Chemistry has proposed the syllabus of the course "Research Methodology for Chemistry" which has been recommended for the approval of the Senate.	
<b>Item 64.21</b>	About an 'addition' of Co-supervisor Dr. Vimalkumar Prajapati, Assistant Professor, Navsari Agriculture University, Surat for PhD Student Ms. Mani Mistry (D22CY002) currently working under the supervision of Dr. Bharatkumar Dholakiya. (Res. 2 of the 118 <sup>th</sup> meeting of the DAAC held on 21/07/2023). MoU signed with Navsari Agriculture University is attached with DAAC recommendation.	Academic Regulation for Doctoral Programme (2023-24) 6.5.1(3)
<b>Reso. 64.21</b>	The request is approved after getting the consent of the proposed Co-supervisor.	
<b>Item 64.22</b>	A request of Ph.D. student Shilpa Sharma (D21PH007), working under the supervision of Dr. K.N. Pathak, for the category conversion from the FSF to FIR (Res. 4.1 of the 42 <sup>nd</sup> meeting of the DAAC held on 17/04/2023). GATE Scorecard attached with DAAC recommendation.	63 <sup>rd</sup> meeting of IAAC held on 7/7/2023 Reso. 63.2 & Reg. no 11.3 (d) July-2019
<b>Reso. 64.22</b>	The request is not approved as per 63 <sup>rd</sup> meeting of IAAC held on 7/7/2023 Reso. 63.2	
<b>Item 64.23</b>	To consider MoUs signed with Institute of Nano Science and Technology, Mohali for academic, research collaboration and student exchange programmes and to create a shared pool of faculty resources between the two institutions. (Annexure -VII)	
<b>Reso. 64.23</b>	The MoU is recommended for the approval by the Senate.	
<b>Item 64.24</b>	To decide about the following points related to the Vocational/ Professional training (internship) of the Final year UG students: (i) To decide the period/duration and the examination of Vocational/ Professional training. (ii) To decide about the modality of Vocational/ Professional training.	
<b>Reso. 64.24</b>	The item was discussed at length and following points were resolved: (i) The duration for Vocational Training will be from the beginning of the	

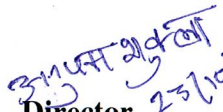


	<p>semester to the last day of teaching.</p> <p>(ii) The students may continue the Vocational training beyond the aforesaid duration. However, they have to submit the progress certificate from the place of training at the time of Vocational training examination.</p> <p>(iii) The Vocational training examination will be conducted in the next week after the completion of End Semester Examination.</p> <p>(iv) The department will assign a mentor for each student and frame a committee to conduct the Vocational training examination.</p> <p>(v) It is expected that the students will carry out their Vocational/ Professional training (internship) at any of the IITs, NITs, recognized Research Laboratories, Government, Semi-government organization, Private organizations and Incubation Centre of the Institute.</p> <p>(vi) If students are unable to get the chance to carry out the training as per point no. (v), they may carry out the same in the institute.</p> <p>(vii) For point no (vi), each Faculty will float the research problems / statements for the selection of the students.</p> <p>(viii) Frame a committee at the department level to consider and approve the request of students wishing to carry out the internship in Interdisciplinary areas / areas of their interest etc.</p>																
	<b>Item from the Chair</b>																
<b>Item 64.25</b>	<p>To consider request of Geotechnical Engineering Section of Department of Civil Engineering for shifting of few core elective subjects from 7<sup>th</sup> Semester to 6<sup>th</sup> semester as given below: (Res. 59.9 of the 59<sup>th</sup> meeting of the DAAC held on 24/08/2023).</p> <table border="1"> <thead> <tr> <th>Name of Electives</th><th>Current Semester</th><th>Proposed Semester</th></tr> </thead> <tbody> <tr> <td>CE457 Rock Mechanics</td><td>Core Ele.-4, 7<sup>th</sup> Sem.</td><td>Core Ele.-2, 6<sup>th</sup> Sem.</td></tr> <tr> <td>CE488 Introduction to Geotechnical Earthquake Engineering</td><td>Core Ele.-7, 7<sup>th</sup> Sem.</td><td>Core Ele.-2, 6<sup>th</sup> Sem.</td></tr> <tr> <td>CE496 Ground Improvement Techniques</td><td>Core Ele.-7, 7<sup>th</sup> Sem.</td><td>Core Ele.-2, 6<sup>th</sup> Sem.</td></tr> <tr> <td>Environmental Geotechnology (proposed new elective)</td><td>--</td><td>Core Ele.-2, 6<sup>th</sup> Sem.</td></tr> </tbody> </table>	Name of Electives	Current Semester	Proposed Semester	CE457 Rock Mechanics	Core Ele.-4, 7 <sup>th</sup> Sem.	Core Ele.-2, 6 <sup>th</sup> Sem.	CE488 Introduction to Geotechnical Earthquake Engineering	Core Ele.-7, 7 <sup>th</sup> Sem.	Core Ele.-2, 6 <sup>th</sup> Sem.	CE496 Ground Improvement Techniques	Core Ele.-7, 7 <sup>th</sup> Sem.	Core Ele.-2, 6 <sup>th</sup> Sem.	Environmental Geotechnology (proposed new elective)	--	Core Ele.-2, 6 <sup>th</sup> Sem.	
Name of Electives	Current Semester	Proposed Semester															
CE457 Rock Mechanics	Core Ele.-4, 7 <sup>th</sup> Sem.	Core Ele.-2, 6 <sup>th</sup> Sem.															
CE488 Introduction to Geotechnical Earthquake Engineering	Core Ele.-7, 7 <sup>th</sup> Sem.	Core Ele.-2, 6 <sup>th</sup> Sem.															
CE496 Ground Improvement Techniques	Core Ele.-7, 7 <sup>th</sup> Sem.	Core Ele.-2, 6 <sup>th</sup> Sem.															
Environmental Geotechnology (proposed new elective)	--	Core Ele.-2, 6 <sup>th</sup> Sem.															
<b>Reso. 64.25</b>	The changes of the semesters for above mentioned subjects are recommended for the approval of the Senate.																
<b>Item 64.26</b>	To consider the request from Centre In-charge Geoinformatics for shifting of core elective subject CE435:GPS and Applications from 7 <sup>th</sup> Semester to 6 <sup>th</sup> Semester.																
<b>Reso. 64.26</b>	The change of the semester for above mentioned subject is recommended for the approval of the Senate.																
<b>Item 64.27</b>	To consider the Readmission request of Mr. Avish Madaan, Admission Number U19EC084 from DoECE (Res. 1 of 81st meeting of the DAAC, DoECE held on 05/10/2023)																
<b>Reso. 64.27</b>	<p>The item was discussed at length and following observations are found:</p> <ol style="list-style-type: none"> <li>1. Mr. Avish Madaan took the admission in July-2019 in the DoECE.</li> <li>2. He has cleared the Semesters I to V with a CGPA of 8.33 at the end of the 5<sup>th</sup> Semester.</li> <li>3. He requested to cancel the admission on March 24, 2022 through email.</li> </ol>																



	<p>4. The request was considered and the admission was cancelled on April 19, 2022 and the security deposit was also returned.</p> <p>5. Now, he wishes to continue the studies from 6<sup>th</sup> Semester onwards and submitted an application to Hon'ble Director for readmission which was forwarded to the department for consideration.</p> <p>6. He has given the reasons of financial and mental condition of the family due to COVID-19.</p> <p>7. The department has no objection if he is allowed for readmission.</p> <p>The readmission is not in the purview of IAAC as such rule is not available in the academic regulations of the institute. However, the readmission request of Mr. Avish Madaan, Admission Number U19EC084 from DoECE is forwarded to the Senate for the recommendation/ approval considering it sympathetically as a special case.</p>	
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23.10.23  
**Member-Secretary, IAAC**

  
23/10/23  
**Director**



VOCATIONAL TRAINING COURSE ELECTRICAL ENGINEERING		Total 200 hours
<b>MODULE I CABLES</b>	1 Identify various parts, skinning and dressing of underground cable. 2 Make straight joint of different types of underground cable. 3 Test insulation resistance of underground cable using megger. 4 Test underground cables for faults and remove the fault.	30 hours
<b>MODULE II SINGLE PHASE TRANSFORMER</b>	1 Verify terminals, identify components and calculate transformation ratio of single-phase transformers. 2 Perform OC and SC test to determine efficiency of single-phase transformer. 3 Determine voltage regulation of single-phase transformer at different loads and power factors. 4 Perform series and parallel operation of two single phase transformers. 5 Verify the terminals and accessories of three phase transformer HT and LT side.	20 hours
<b>MODULE III THREE PHASE TRANSFORMER</b>	1 Perform 3 phase Method of connecting three phase operation (i) delta-delta, (ii) delta-star, (iii) star-star, (iv) star-delta by use of three single phase transformers. 2 Perform testing of transformer oil. 3 Practice of general maintenance of transformer. Types of Cooling, protective devices, bushings and termination etc. Materials used for winding and winding wires in small transformer.	40 hours
<b>MODULE IV BATTERY AND CELL</b>	1 Use of various types of cells. 2 Practice on grouping of cells for specified voltage and current under different conditions and care. 3 Prepare and practice on battery charging and details of charging circuit. 4 Practice on routine, care/ maintenance and testing of batteries. 5 Determine the number of solar cells in series / parallel for a given power requirement.	30 hours
<b>MODULE V PROJECT I</b>	Design and implementation of Small single phase transformer design for electronic circuits	50 hours
<b>MODULE VI PROJECT II</b>	Design and implementation of battery charger	30 hours





# Sardar Vallabhbhai National Institute of Technology (SVNIT) Surat

## Department of Electrical Engineering

B.Tech. II (EE) Vocational Training (200 hrs) EEV01/EEP01/EEV02/EEP02	Scheme	L	T	P	Credit
		0	0	10	05

### Vocational Training in Solar and Wind Energy Conversion

Coordinators: Prof. A.K Panchal and Dr. Sanjay Tolani

- Understanding the basics of solar and wind energy conversion into electrical energy.
- Obtain the I-V and P-V characteristics of a solar cell by solving the single-diode model using the Newton-Raphson method.
- Develop MATLAB simulation model of the P&O and INC MPPT algorithms for a PV panel connected with a DC-DC Boost converter through a resistive load.
- Design and develop a 45 V, 300 W DC-DC Boost converter laboratory prototype.
- Learn 32-bit STM32 Arm Cortex microcontroller to generate the PWM pulses for the developed DC-DC Boost converter.
- Learn voltage and current sensors to measure the PV module's voltage and current.
- Obtain experimental I-V and P-V curves by supplying the variable duty ratio (0 to 1) to the developed Boost converter and measuring the PV module's voltage and current.
- Implement the MPPT algorithms on the developed Boost converter.
- Learn and compute the characteristics and performance of the wind turbine system on the wind emulator.

*CS/EE*



### Hands-on training FPGA based Control of Power Electronic Converters

B. Tech. III (EE), Smester VI	Scheme	L	T	P	Credit
<b>Hands-on training: FPGA based Control of Power Electronic Converters</b> <b>EEV06</b>		0	0	10	5

#### Course outcomes:

At the end of this course the students will be able to

CO1	write programs using Verilog HDL code.
CO2	simulate the programs using integrated development environment (IDE).
CO3	interface the FPGA with external hardware using ADC/DAC.
CO4	generate gate pulses to control various power electronic converters.
CO5	develop a laboratory prototype of FPGA based controller for PE converters.

1.	<b>Introduction</b> Review of digital logic circuits, Different kinds of programmable logic devices: Field Programmable Gate Array (FPGA), Programmable Logic Device (PLD), FPGA manufacturers (Xilinx, Altera, Actel, Lattice Semiconductor, Atmel). FPGA applications. Adjoining devices. Instruments and software.	2 Hours
2.	<b>The Structure of FPGA</b> FPGA general description. Different kinds of FPGA packages. FPGA architecture. Internal hard modules of FPGA (CLB, Block RAM, DCM), their meanings and usage. Different kinds of I/O modules, their usage and configuration	4 Hours
3.	<b>FPGA Design Flow</b> Architecture design. Project design using Verilog Hardware Description Language (HDL). Defining testing methodology and test bench design. RTL simulation, synthesizing, implementation, gate level simulation of design. Reusing of internal hard modules during design and implementation.	6 Hours
4.	<b>FPGA Configuration and Testing Methodology</b> Different types of FPGA configuration files. Generation of configuration file and its loading into FPGA. Functional and gate level testing. SDF file description and usage.	8 Hours

#### Laboratory experiments:

S.No.	Name of the Experiment	Hours
1.	Introduction to integrated development environment (IDE) for system Verilog	6
2.	Getting acquainted with Verilog programming (i) Full adder, (ii) Up-down counter (iii) LED blink (iv) LCD display	10
3.	Interfacing using GPIO pins	6



4.	Generation of Arbitrary waveforms using Look up table (LUT)	10
5.	ADC/DAC interfacing	10
6.	Open-loop control of DC-DC converters (i) Buck (ii) Boost (iii) Buck-boost	10
7.	Square wave operation of Single-phase inverter (i) Half- Bridge with R and R-L load (ii) Full- Bridge with R and R-L load	8
8.	Single phase AC voltage controller with R and R-L load	8
9.	Operation of three phase inverter in 120° and 180° conduction modes	8
10.	Generation of gating pulses using Sine PWM technique	8
11.	Transformation from 3-phase to 2-phase	8
12.	Transformation from 2-phase to arbitrarily rotating reference frame	8
13.	Mini Project	50
14.	Continuous Evaluation	30
Total (Notional Hours)		200

#### **Books Recommended:**

1. "Verilog HDL", A guide to Digital Design and Synthesis Samir Palnitkar SunSoft Press 1996.
2. P. Chu Pong, "FPGA Prototyping by Verilog Examples", Xilinx Spartan, 3rd version, 2008
3. DE1-SoC Getting started Guide for ALTERA Cyclone V GX, " <https://www.terasic.com.tw/cgi-bin/page/archive.pl?Language=English&CategoryNo=165&No=836&PartNo=4#contents>"
4. NPTEL video Lectures on "Hardware modelling using Verilog by Prof. Indaranil Sengupta, IIT Kharagpur".



## B Tech III (EE) Vocational Training EEV06

### Vocational Courses on Embedded System and Power Electronics

#### Module 1:

Content	Hrs.	COs
<ul style="list-style-type: none"><li>Revising the basis components</li></ul>	10	<ul style="list-style-type: none"><li>understand the physical form of electrical components and power semiconductor switched</li><li>building skill of system simulation in MATLAB/Simulink environment</li><li>building skill of embedded C programing of 8-bit and 32-bit controllers</li><li>learning the practical aspects of PCB and IoT</li><li>develop laboratory prototype of power electronic systems.</li></ul>
<ul style="list-style-type: none"><li>Power Semiconductor Switches and it's Control</li></ul>	20	
<ul style="list-style-type: none"><li>Simulation in MATLAB/Simulink</li></ul>	20	
<ul style="list-style-type: none"><li>C Language for Embedded System Programmers</li></ul>	10	
<ul style="list-style-type: none"><li>Embedded C Programing of 8-bit Microcontroller</li></ul>	30	
<ul style="list-style-type: none"><li>Embedded C Programing of 32-bit Microcontroller</li></ul>	30	
<ul style="list-style-type: none"><li>Programming STM32Fxx Microcontroller using MATLAB/Simulink</li></ul>	30	
<ul style="list-style-type: none"><li>PCB Designing</li></ul>	10	
<ul style="list-style-type: none"><li>Internet of Things (IoT)</li></ul>	05	
<ul style="list-style-type: none"><li>Project Development</li></ul>	35	
	200	

#### Module 2:

Content	Hrs.	COs
<ul style="list-style-type: none"><li>Simulation Power Electronics Simulations with PSIM and SmartCtrl</li></ul>	20	<ul style="list-style-type: none"><li>building skill of system simulation in PSIM and PLECS environment</li><li>imparting skill of power electronics converter realization</li><li>development of electrical drives solutions</li><li>development of renewable energy solution</li><li>learning programing of DSP and FPGA controllers</li><li>develop laboratory prototype of power electronic systems.</li></ul>
<ul style="list-style-type: none"><li>Simulation Power Electronics Simulations with PLECS</li></ul>	20	
<ul style="list-style-type: none"><li>Implementation of Power Converters using 32-bit Microcontroller</li></ul>	30	
<ul style="list-style-type: none"><li>Implementation of Electrical Drives using 32-bit Microcontroller</li></ul>	30	
<ul style="list-style-type: none"><li>Implementation of Renewable Energy System Integration</li></ul>	30	
<ul style="list-style-type: none"><li>Implementation of Custom Power Devices for Power Quality</li></ul>	30	
<ul style="list-style-type: none"><li>Programing of DSP Controller and FPGA</li></ul>	10	
<ul style="list-style-type: none"><li>Project Development</li></ul>	30	
	200	

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**Arduino and MicroPython Programming for the development of IoT Systems****VS101/VS102/VS201/VS202 Arduino and MicroPython Programming for the development of IoT Systems****Course Outcomes (COs):**

At the end of the course, students will be able to:

**CO1: Describe** framework of IoT systems and associated programming environments of Arduino and MicroPython.

**CO2: Solve** logical problems using MicroPython and Arduino

**CO3: Understand** the underlying principles of Embedded Systems in context of programming

**CO4: Develop** simple to sophisticated IoT systems using Arduino and MicroPython

**CO5: Create** an application oriented IoT system.

**CO6: Evaluate** the IoT system based on the performance parameters.

Sr. No.	Contents	Contact hours
1.	<b>Arduino:</b> Getting Started with Arduino, Introduction to microcontroller, Why Arduino?, Working with Arduino IDE, Arduino on the ESP32, Introduction to Arduino programming, Libraries, Simple pin operations, LED Blinking, Toggling the LED, Timers and Delay, Pins and GPIO, PWM, ADC, SPI bus, I2C bus, Sensors, Displays, Motors, Wi-Fi	40
2.	<b>Micropython:</b>  <b>1. Getting Started with MicroPython</b> Source control with git, Compiling and building the code, Building the MicroPython cross-compiler, Different "ports" of MicroPython, Writing tests, compilation process in MicroPython, Compiler passes, Memory Management <b>2. Introduction to microcontroller</b> Microprocessor vs Microcontroller, Types of Microcontrollers, Applications of Microcontrollers, uC Architecture, PIN Diagram, PORT configuration, case study of available microcontrollers. <b>3. Why micro python?</b> Use cases, development cycle, available online resources, Human-Readable aspects, Exception- and Error-Handling, Hardware Abstraction layer <b>4. Working with Thonny IDE</b> Installing Thonny, The User Interface, Other UI Features, The Code Editor, The Package Manager, Debugging, Workflow, Variable Scope Highlight <b>5. Micro Python on the ESP32</b> Basics of ESP32, Requirements, Getting the firmware, Deploying the firmware, Serial prompt, programming workflow <b>6. Libraries</b>	50



	<p>Standard: array – arrays of numeric data, asyncio – asynchronous I/O scheduler, binascii – binary/ASCII conversions, builtins – builtin functions and exceptions, cmath – mathematical functions for complex numbers, io – input/output streams, json – JSON encoding and decoding, math – mathematical functions, os – basic “operating system” services, random – generate random numbers, time – time related functions, zlib – zlib decompression, _thread – multithreading, machine – functions related to the hardware, micropython – access and control MicroPython internals</p> <p><b>7. Peripheral operations</b> Simple pin operations, LED Blinking, Toggling the LED, Pins and GPIO, PWM, ADC, SPI, I2C, DAC, UART</p> <p><b>8. Internal Interfaces:</b> Timers programming, using interrupts, flash read-write</p> <p><b>9. External Interfaces</b> Interfacing various Sensors, interfacing Displays, interfacing Servo Motors, interfacing stepper motor, interfacing DC motor,</p> <p><b>10. Communication interfaces:</b> Wi-Fi, Bluetooth, PC Serial, IR control interface, LoRa interface</p> <p><b>11. Navigation Interfaces:</b> GPS interface, IMU interface, pressure sensor interface, distance sensor interface, LiDAR interface, camera interface.</p>	
3.	<p><b>IoT Systems:</b></p> <ol style="list-style-type: none"> <li>1. Collection of Data from sensors and display on the monitor.</li> <li>2. Sending the data from one node to another without the use of the internet.</li> <li>3. Uploading the data to the cloud.</li> <li>4. Downloading the data from the cloud.</li> <li>5. Operating the transducers based on the downloaded data.</li> </ol>	50
4.	<p><b>Integration of Arduino, Micropython and IoT systems:</b> WiFi Mesh Networking, Bluetooth Mesh Networking, WiFi server-client programming, HTTP(S) server communication, MQTT(S) server communication, local web hosting, Encryption/Decryption of data, application projects based on IoT and MicroPython like, smart-metering, smart data collection, and intelligent transport system.</p>	60

#### References:

1. Arduino: A Technical Reference: A Handbook for Technicians, Engineers, and Makers, J. M. Hughes, O'Reilly Publishers.
2. Programming With Micropython, T. Venkata Ramana, Notion Press.
3. Internet of Things with Arduino Cookbook, Marco Schwartz, Packt Publishing
4. <https://www.vectorindia.org/micro-python.html>

#### Assessment: 100 Marks

1. Written mark at the time of completion: 15
2. Continuous evaluation: 15 (Minimum two quizzes)
3. Practical assessment at the time of completion: 40
4. Presentation: 15
5. Viva: 15



# VOCATIONAL TRAINING

on

## Python Programming

VS101/VS102/VS201/VS202 Python Programming

Contact Hours: 200

### Course Outcomes (COs):

At the end of the course, students will be able to:

**CO1:** Describe the basic framework of Python programming language and associated concepts of programming in high level language.

**CO2:** Explain about various Python distributions, open-source IDEs, and open-source python packages

**CO3:** Solve the logical programming problems using python

**CO4:** Compare files with read-modify-write operations using Python

**CO5:** Evaluate various mathematical expressions and logic-statement using Python.

**CO6:** Analyse and debug the Python-based Programs.

Sr. No.	Contents	Contact hours
1.	<b>Basics of Python Programming:</b> a) Introduction: Introduction to Python, Program Development Cycle, Input, Processing, and Output, Displaying Output with the Print Function, Comments, Variables, Reading Input from the Keyboard, Performing Calculations, Operators. Type conversions, Expressions, More about Data Output. b) Data Types, and Expression: Strings Assignment, and Comment, Numeric Data Types and Character Sets, Using functions and Modules. Decision Structures and Boolean Logic: if, if-else, if-elif-else Statements, Nested Decision Structures, Comparing Strings, Logical Operators, Boolean Variables. Repetition Structures: Introduction, while loop, for loop, Calculating a Running Total, Input Validation Loops, Nested Loops. c) Control Statement: Definite iteration for Loop Formatting Text for output, Selection if and if else Statement Conditional Iteration The While Loop. Strings and Text Files: Accessing Character and Substring in Strings, Data Encryption, Strings and Number Systems, String Methods Text Files d) File Operations: Reading config files in python, Writing log files in python, Understanding read functions, read(), readline() and readlines(), Understanding write functions, write() and writelines(), Manipulating file pointer using seek, Programming using file	100



	operations	
2.	<b>Python Modules and GUI based project:</b> <ol style="list-style-type: none"> <li>Design with Function: Functions as Abstraction Mechanisms, Problem Solving with Top Down Design, Design with Recursive Functions, Case Study Gathering Information from a File System, Managing a Program's Namespace, Higher Order Functions.</li> <li>List and Dictionaries: Lists, Defining Simple Functions, Dictionaries.</li> <li>Modules: Modules, Standard Modules, Packages, NumPy (Matrices, vectors, linear algebra), SciPy (Package for numerical computations), Matplotlib (Plotting)</li> <li>The Behavior of Terminal Based Programs and GUI -Based, Programs, Coding Simple GUI-Based Programs, Other Useful GUI Resources, "PyQt" for creating graphical user interfaces for interactive programs</li> </ol>	50
3.	<b>Python-based web development:</b> <ol style="list-style-type: none"> <li>Python Django: Integration of python, html, css, and Jscript. MySQL database server development and Django interface with MySQL. Admin and user interfaces in Python-Django.</li> <li>Communication protocols implementation like HTTP and MQTT.</li> <li>Deployment of server using apache and Nginx.</li> <li>Python-Django Cloud server deployment on AWS/Google cloud.</li> </ol>	50

#### References:

1. Learning Python: Crash Course Tutorial, by Guido Van Rossum
2. Python: For Beginners A Crash Course Guide, by Timothy C Needham
3. Python Cookbook, 3rd Edition: Recipes for Mastering Python 3, by David Beazley and Brian K. Jones, on O'Reilly Atlas
4. Programming Computer Vision with Python" by Jan Erik Solem "The Definitive Guide to Pylons" by James Gardner
5. Python Cook Book Start Here: Python Programming for Beginners
6. <https://www.python.org/about/gettingstarted/>
7. <https://www.geeksforgeeks.org/introduction-to-python/>
8. [https://www.w3schools.com/python/python\\_intro.asp](https://www.w3schools.com/python/python_intro.asp)

#### Assessment: 100 Marks

1. Written Test: 50 Marks
2. Presentation/Viva: 50 Marks



# VOCATIONAL TRAINING

on

## C++ Programming

### VS101/VS102/VS201/VS202 C++ Programming

#### Course Outcomes (COs):

At the end of the course, students will be able to:

- CO1:** Describe the basics of C++ programming language and associated concepts of programming in high-level languages
- CO2:** Explain about Pointers, Arrays, and Structures used in C++
- CO3:** Solve the problems using functions and Classes in C++
- CO4:** Analyze the use of Operator overloading and Derived Classes in C++.
- CO5:** Implement Exception handling to avoid probable errors from C++ code.

Sr. No.	Contents	Contact Hours
1.	<b>Standard Library:</b> Standard libraries, output strings, input vectors, range checking, lists, Maps, container overview, algorithms, iterators, I/O iterators, traversals and Predicates, algorithms using member functions, algorithm overview, Complex Numbers, vector arithmetic, standard library overview	30
2.	<b>Types and Declarations:</b> Types, fundamental types, Booleans, characters, character literals, integers, integer literals, floating-point, types, literals, sizes, void, enumerations, declarations, names, scope, initialization, objects, typedefs	30
3.	<b>Pointers, Arrays, and Structures:</b> Pointers, zero, arrays, string literals, pointers into arrays, constants, pointers and constants, references, void*, data structures	30
4.	<b>Functions:</b> Function declarations and definitions, argument passing, return values, function overloading, ambiguity resolution, default arguments, stdargs, pointers to functions, macros, exceptions, throw and catch, exceptions, and program structure	30
5.	<b>Classes:</b> classes, class members, access control, constructors, static members, default copy, const member functions, this, structs, inclass function definition, concrete classes, member functions and helper functions, overloaded operators, use of concrete classes, destructors, default construction, local variables, user-defined copy, new and delete, member objects, arrays, static storage, temporary variables, unions	20



6.	<b>Operator Overloading:</b> Notation, operator functions, binary and unary operators, predefined meanings for operators, user-defined meanings for operators, operators and namespaces, a complex type, member and nonmember operators, mixed-mode arithmetic, initialization, copying, conversions, literals, helper functions, conversion operators, ambiguity resolution, friends, members and friends, large objects, assignment and initialization, subscripting, function call, dereferencing, increment and decrement, a string class	30
7.	<b>Derived Classes:</b> Concepts and classes, derived classes, member functions, construction and destruction, class hierarchies, type fields, virtual functions, abstract classes, traditional class hierarchies, abstract classes as interfaces, localizing object creation, abstract classes and class hierarchies	10
8.	<b>Exception Handling:</b> Error handling, grouping of exceptions, catching exceptions, catch all, rethrow, resource management, auto_ptr, exceptions and new, resource exhaustion, exceptions in constructors, exceptions in destructors, exceptions that are not errors, exception specifications, unexpected exceptions, uncaught exceptions, exceptions and efficiency, error handling alternatives, standard exceptions.	20

#### References:

1. Stroustrup, Bjarne. "The C++ Programming Language." Addison-Wesley Professional, 2013.
2. Lippman, Stanley B., Josée Lajoie, and Barbara E. Moo. "C++ Primer." Addison-Wesley Professional, 2012.
3. Meyers, Scott. "Effective Modern C++: 42 Specific Ways to Improve Your Use of C++11 and C++14." O'Reilly Media, 2014.
4. Williams, Anthony. "C++ Concurrency in Action: Practical Multithreading." Manning Publications, 2019.
5. Josuttis, Nicolai M. "The C++ Standard Library: A Tutorial and Reference." Addison-Wesley Professional, 2012.

#### Assessment: 100 Marks

1. Written test: 50
2. Viva: 50



**VS101/VS102/VS201/VS202/PS301/PS302 Professional Experience**

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**1. Course Outcomes (COs)**

At the end of the professional experience, the students will be able to:

<b>CO1</b>	<b>Understand</b> the fundamentals of the selected problem statement.
<b>CO2</b>	<b>Identify</b> appropriate literature, tools, and techniques relevant to the selected problem statement.
<b>CO3</b>	<b>Develop</b> a complete system to achieve the objectives as specified by the selected problem statement.
<b>CO4</b>	<b>Compare</b> their product with the state-of-the-art from various perspectives.
<b>CO5</b>	<b>Demonstrate</b> their capacity for self-learning, oral and written communication, and entrepreneurship.

**2. Description****a. Development of a biometric-based attendance system for DoECE.**

Abstract: In this project, the student has to develop a biometric attendance system. The system should have a database and attendance record of students for theory, laboratory, and tutorial classes. The system should collect data from multiple users and update the database in each of the theory, laboratory, and tutorial classes. As and when required, by logging into the system, the authority should be able to collect all the attendance records of each student user including user details and incoming & outgoing. It should be possible to download the data and export it to an Excel sheet.

**OR**

**b. Development of Digital Library for DoECE.**

Abstract: In this project, the student has to develop a GUI-based search catalog and digital library for DoECE. It should contain a database of all library stock, question papers, resources shared by the faculty members, lab manuals, links to other e-resources, etc. It should be shared in the department's local drive and should have login-based access. The system should be able to generate various query-based reports (Resource-wise, usage-wise, access-wise, etc.) in the form of an Excel sheet.

**3. Evaluation Criteria: Total Marks = 100**

1. Written Marks = 00
2. Continuous Evaluation = 00
3. Practical assessment (Demonstration (30) and Report (30)) = 60
4. Presentation = 20
5. Viva = 20



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**Annexure -III**  
**of the 64th meeting of the IAAC**

**Department of Mechanical Engineering**

**Vocational Training / Professional Experience**  
**(Mandatory for Exit; and Optional for others)**

<b>Year</b>	<b>Odd Semester (1<sup>st</sup>, 3<sup>rd</sup>, 5<sup>th</sup>)</b>	<b>Hours</b>	<b>Even Semester (2<sup>nd</sup>, 4<sup>th</sup>, 6<sup>th</sup>)</b>	<b>Hours</b>
1 <sup>st</sup>	Machining Practice + Internal Combustion & Automobile Engg.(ICAE) + Refrigeration	200 Hours	2D Drafting using CAD software	200 Hours
2 <sup>nd</sup>	<b>Any one from the Following –</b> <ul style="list-style-type: none"> <li>• Welding Technology</li> <li>• Refrigeration &amp; Air conditioning</li> <li>• Renewable Energy</li> </ul>	200 Hours	3D Drafting/modelling using CAD software	200 Hours
3 <sup>rd</sup>	<b>Any one from the Following –</b> <ul style="list-style-type: none"> <li>• Internal Combustion &amp; Automobile Engg. (ICAE)</li> <li>• Non Destructive Testing</li> <li>• Industrial Safety</li> </ul>	200 Hours	Mini project (3D modelling, Analysis and Manufacturing of machine components)	200 Hours



**Annexure -IV**  
**of the 64th meeting of the IAAC**

**MAV02**

**Data Analytics using R Programming, 2nd Semester**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credit</b>
<b>0</b>	<b>0</b>	<b>10</b>	<b>05</b>

**1. Course Outcomes (COs):**

At the end of the course, students will be able to:

- CO1 gain a solid understanding of key concepts and techniques in data science, including data manipulation, data visualization, statistical analysis.
- CO2 develop skills in programming languages commonly used in data science such as R.
- CO3 familiar with important R packages used in data science. They will be able to load and utilize these packages.
- CO4 develop the concept of regression, classification, clustering, dimensionality reduction, and evaluation of model performance.
- CO5 apply techniques for data manipulation in R.

**2. Syllabus**

- **Introduction to Data Science** (30 Hours)  
Introduction of Data Science and Big Data, Definition of Data Science and Big Data, Big Data Example, Data Explosion: Data Volume, Data Variety, Selecting Rows/Observations, Rounding Number, Selecting Columns/Fields, Merging Data, Data Aggregation, Data Munging Techniques.
- **Introduction to R and its Packages** (25 Hours)  
What Is R?, Why R?, Installing R, R Ides, Loading Packages, Some Important Packages e.g. nleqslv, Graphis, ggplot2, dygraphs, random Forest.
- **R Basics and Importing Data** (25 Hours)  
R Basic Data types, Lists, IF statements, Loops Tuples, Functions, Array, Selection by position & Labels, Reading CSV Files, Saving in R Data, Loading R Data Objects, Writing Data to CSV File.
- **Statistics Basics** (50 Hours)  
Central Tendency, Mean, Median, Mode, Skewness, Normal Distribution, Standard Deviation, Data Deviation & Distribution, Variance, Bias Variance Trade-Off, Outlier Analysis, What is an Outlier? Inter Quartile Range, Box & Whisker Plot, Upper Whisker, Lower Whisker, Scatter Plot, Missing Value Treatment, What Is NA?, Correlation, Pearson Correlation, Positive & Negative Correlation.
- **Regression** (40 Hours)  
Linear Regression, Linear Equation, Slope, Intercept, R Square Value, Estimation of model parameters.
- **Report Writing using Latex** (30 Hours)  
Installation of LaTeX, Formatting of output document, Mathematical formulae, Table in Latex, Drawing with LaTeX, Steps of Writing Report.

. (Total:200 Hours)

### **3. Reference Books:**

1. B. Uma Maheswari R. Sujatha, *Introduction to Data Science: Practical Approach with R and Python*, Wiley, 2021.
2. Dr. Bharati Motwani, *Data Analytics with R*, Wiley, 2019.
3. Secma Acharya, *Data Analytics using R*, , First Edition , McGraw Hill Education, 2018.
4. G. Kauermann, H. Küchenhoff, and C. Heumann, *Statistical Foundations, Reasoning and Inference: For Science and Data Science*, Springer Series in Statistics, 2021.
5. A. Diller, *Latex Line by Line - Tips & Techniques for Document Processing*. John Wiley and Sons Inc, 1996.



## 1. Course Outcomes (COs)

At the end of the course the students will be able to :

- CO1: utilize features of MATLAB for scientific computation
- CO2: develop simple computer programs in MATLAB
- CO3: apply the skills to evaluate scientific problems
- CO4: plot graphs in 2D and 3D
- CO5: visualize and analyze data effectively using MATLAB

## 2. Syllabus

- **INTRODUCTION TO MATLAB** (30 Hours)  
Starting MATLAB, MATLAB Windows, Working in the Command Window, Arithmetic Operations with Scalars, Display Formats, Elementary Math Built-In Functions, Defining Scalar Variables, Useful Commands for Managing Variables, Script Files.
- **CREATING ARRAYS** (30 Hours)  
Creating a One-Dimensional Array (Vector), Creating a Two-Dimensional Array (Matrix), Notes About Variables in MATLAB, The Transpose Operator, Array Addressing, Using a Colon : in Addressing Arrays, Adding Elements to Existing Variables, Deleting Elements, Built-In Functions for Handling Arrays, Strings and Strings as Variables.
- **MATHEMATICAL OPERATIONS WITH ARRAYS** (30 Hours)  
Addition and Subtraction, Array Multiplication, Array Division, Element-By-Element Operations, Using Arrays in MATLAB Built-In Math Functions, Built-in Functions for Analyzing Arrays, Generation of Random Numbers.
- **SCRIPT AND FUNCTIONS** (30 Hours)  
Creating and running M-Files, Creating a Function File, Structure of a Function File, Saving a Function File, Using a User-Defined Function, Data import and export.
- **LOOPS AND CONTROLS** (35 Hours)  
Relational and Logical Operators, Conditional Statements, The switch-case Statement, Loops, Nested Loops and Nested Conditional Statements, The Break and continue Commands
- **GRAPHICS PLOT** (30 Hours)  
Basic 2D and 3D Plots, Labels, Title and Legend, Axis Control, Zoom In and Zoom Out Using Plot Editor, Subplots, Multiple Figure Windows, Parametric Plots.
- **SYMBOLIC CALCULATION** (15 Hours)  
Symbols, Designing Formula, Differentiation, Integration.

**Total Contact Hours: 200**

### 3. Books Recommended

1. Rudra Pratap, Getting Started with MATLAB: A Quick Introduction for Scientists & Engineers, Oxford Publication, 2010.
2. Stephen J. Chapman, MATLAB Programming for Engineers, 6<sup>th</sup> Edition, Cengage Learning, 2019.
3. Amos Gilat, MATLAB: An Introduction with Applications, 3<sup>rd</sup> Edition, John Wiley & Sons, 2008.
4. Brian R. Hunt, Ronald L. Lipsman, and Jonathan M. Rosenberg. A guide to MATLAB: for beginners and experienced users, Cambridge University Press, 2014.
5. David McMahon, MATLAB Demystified, The McGraw-Hill Companies, USA, 2007.



Research Methodology	Scheme	L	T	P
MA-XXX		4	0	0
Total Contact Hours: 56				

Contents		
<b>Unit-1</b>	<b>Introduction to Research Methodology and Review of Literature</b>	<b>Hours: 10</b>
	Types of research, its approaches & significance; Research and scientific methods; Step involved in research process, Criteria of good research & problems for researchers, Definition of the research problems; Identifying and formulating the problem, Necessity of defining the research problem and techniques involved in it. <b>Problem Design:</b> Meaning of Research Design, Need for Research Design, Features of Design, Important Concepts Relating to Research Design, Different Research Designs, and Basic Principles of Experimental Designs.	
<b>Unit-2</b>	<b>Statistical Techniques</b>	<b>Hours: 12</b>
	Conditional probability, Independence, Bayes' Rule. Expectation and variance. Distribution functions. Discrete distributions: Binomial, Poisson. Continuous distributions and densities: Exponential, Normal, Central Limit Theorem and Normal approximations, Law of Large Numbers. Statistical Inference: Introduction of sampling, Need for sampling; Steps in sampling design; Sampling distributions of mean and variance, Important sampling distributions (of mean, proportion, t-, F-, and Chi-square distribution). <b>Data Collection Methods:</b> Methods of data collection: Experimental data, field data, data from other sources; Analysing data: Error analysis and statistical analysis including mean, mode, median, standard deviation, skewness and kurtosis, curve fitting, correlation and regression.	
<b>Unit-3</b>	<b>Mathematical Analysis</b>	<b>Hours: 12</b>
	Advanced numerical methods, finite difference methods, and finite element methods. Error estimation, stability, convergence for initial value problem and boundary value problem. Introduction to fractional calculus. Introduction to evolutionary approaches, genetic algorithm (GA), particle swarm optimization (PSO).	
<b>Unit-4</b>	<b>Research Tools and Techniques</b>	<b>Hours: 12</b>
	MS-Office, Scientific work place, Latex. Introduction to MATLAB, Python. Methods to Search Required Information Effectively, Reference Management Software, Software for Detection of Plagiarism. Abstracting and indexing of Journals, Concept of citation index, impact factor, H-index.	
<b>Unit-5</b>	<b>Interpretation and Report writing</b>	<b>Hours: 10</b>
	Meaning of Interpretation, Technique of Interpretation, Precaution in Interpretation, Significance of Report writing, Difference steps in Writing Report,	

	<p>Layout of the Research Report, Types of Reports, Precautions for writing research reports, Oral Presentation.</p> <p><b>Meaning and Content of Intellectual Property Rights (IPR):</b> Patents – Meaning of Patent, Concept of Novelty, Inventiveness and utility. Copyright-Meaning &amp; scope of Copyright, Concept of originality.</p>
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<b>Recommended books</b>	
1	C. R. Kothari and G. Garg: Research Methodology: Methods and Techniques, 4 <sup>th</sup> Edition, New Age International, 2019.
2	R. Pannerselvam: Research Methodology, 2 <sup>nd</sup> Edition, PHI Learning, 2014.
3	Sheldon M Ross: Introduction to Probability and Statistics for Engineers and Scientists, 5 <sup>th</sup> Edition, Elsevier, 2014.
4	G. D. Smith: Numerical Solution of Partial Differential Equations: Finite Difference Methods, 3 <sup>rd</sup> Edition, Clarendon Press.
5	Radhey S. Gupta: Elements of Numerical Analysis, 2 <sup>nd</sup> Edition, Cambridge University Press, 2015
6	Kenneth A. De Jong: Evolutionary Computation, MIT Press, 2016.
7	Keith B. Oldham, Jerome Spanier: The Fractional Calculus: Theory and Applications of Differentiation and Integration to Arbitrary Order, Dover Publications Inc., 2006.



<b>M.Sc.– V (Chem), Semester – IX</b>	<b>Scheme</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credit</b>
<b>RESEARCH METHODOLOGY IN CHEMISTRY</b>		<b>3</b>	<b>0</b>	<b>0</b>	<b>03</b>
<b>CY505</b>					

<b>1.</b>	<b>Course Outcomes (COs):</b> <b>At the end of the course, the students will be able to</b>
CO1	Impart knowledge of introduction and purpose of research.
CO2	Understand the importance of literature review to identify research problem.
CO3	Practice research paper writing and learn presentation of scientific research data.
CO4	Interpret data obtained from characterization techniques using various softwares.
CO5	Learn laboratory safety, chemical safety and research ethics.

<b>2.</b>	<b>Syllabus</b>	
	<b>RESEARCH BASICS</b>	<b>(05 Hours)</b>
	Basics of scientific research, research process and steps involved, Hypothesis, Research proposals and aspects, literature survey, sources of information, review.	
	<b>DATA AND SAMPLE COLLECTION</b>	<b>(12 Hours)</b>
	Data types and collection: qualitative and quantitative, data processing, data analysis. Sampling: Concepts of Statistical Population, Sample, Sampling Frame, Sampling Error, Sample Size, Non Response. Characteristics of a good sample. Probability Sample – Simple Random Sample, Systematic Sample, Stratified Random Sample & Multi-stage sampling. Determining size of the sample– Practical considerations in sampling and sample size.	
	<b>DATA ANALYSIS AND PRESENTATION</b>	<b>(05 Hours)</b>
	Experiment Design and Data Preparation – Univariate analysis (frequency tables, bar charts, pie charts, percentages), Bivariate analysis – Cross tabulations and Chi-square test including testing hypothesis of association.	
	<b>SOFTWARES FOR CHEMISTRY RESEARCH</b>	<b>(12 Hours)</b>
	General awareness of software packages and other scientific applications. Application and uses of common softwares in chemistry-SciFinder, Origin, ChemSketch, Chemdraw, softwares for NMR: Mestronova and Topspin, XPS Peak 41 and ImageJ for micrographs.	
	<b>LABORATORY SAFETY AND ETHICS OF RESEARCH</b>	<b>(03 Hours)</b>
	Safety rules of laboratory acquaintance of experimental set up, importance of safety and security of data. Research ethical issues, Intellectual property rights, Copy right, royalty, citation and acknowledgement, Reproducibility, plagiarism.	
	<b>SCIENTIFIC REPORT WRITING AND PUBLICATION PROCESS</b>	<b>(08 Hours)</b>
	Writing of research report and synopsis (steps involved), paper writing (steps involved), review writing, report preparation, publication process, selection of journals, citation index, impact factor, h-index.	

Subject Code: ##nXX; ##: Department Identity, n: Year, XX: Subject Sequence number XX: last digit 0 (subject offered in both ODD and EVEN semesters, XX: 01 to 30 – last digit ODD and EVEN for ODD and EVEN semesters (Mandatory Core), XX: 31 to 50 (Optional Core), XX: 51 to 99 (Elective), Subjects list for Minor and Honor (M/H#1-4), Subjects list for Specialization track (#1-4) EG: Engineering Subject, SC: Science Subject (offered combinedly by departments) (SVNIT Surat)

**Sardar Vallabhbhai National Institute of Technology (SVNIT) Surat**

**Department of Chemistry**

**Five Years Integrated M.Sc. Chemistry**

	<b>(Total Contact Time: 45 Hours)</b>
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<b>3.</b>	<b>Books Recommended</b>
1	Kumar, R., <i>Research Methodology - A Step-By-Step Guide for Beginners</i> , Pearson Education, Delhi (2006).
2	Montgomery, D. C., <i>Design &amp; Analysis of Experiments</i> , 5 <sup>th</sup> Ed., Wiley India (2007).
3	Kothari, C. K., <i>Research Methodology-Methods and Techniques</i> , 2 <sup>nd</sup> Ed., New Age International, New Delhi.
4	Chakraborty, T., Ledwani, L. <i>Research Methodology in Chemical Sciences</i> , 1 <sup>st</sup> Ed. Apple Academic Press and CRC Press (2016).
5	Mendham, J. et al., <i>Vogel's Textbook of Quantitative Chemical Analysis</i> , 6 <sup>th</sup> Ed. Pearson Education (2009).
6	Banerjee, S. <i>Research Methodology for Natural Sciences</i> , IISc, Press (2022).

Subject Code: ##nXX; ##: Department Identity, n: Year, XX: Subject Sequence number XX: last digit 0 (subject offered in both ODD and EVEN semesters, XX: 01 to 30 -- last digit ODD and EVEN for ODD and EVEN semesters (Mandatory Core), XX: 31 to 50 (Optional Core), XX: 51 to 99 (Elective), Subjects list for Minor and Honor (M/H#1-4), Subjects list for Specialization track (#1-4) EG: Engineering Subject, SC: Science Subject (offered combinedly by departments) (SVNIT Surat)





**Sardar Vallabhbhai National Institute of Technology, Surat**

and

**Institute of Nano Science and Technology, Mohali**

**MEMORANDUM OF UNDERSTANDING**

In order to promote co-operation between Sardar Vallabhbhai National Institute of Technology, hereinafter referred to as "SVNIT" and the Institute of Nano Science and Technology, Mohali, Punjab, hereinafter referred to as "INST", the two institutions agree as follows:

1. The two institutions will encourage direct contact and co-operation between their faculty and administrative staff, departments and research institutions.
2. Within mutually acceptable fields, the following general forms of co-operation for programmes or activities will be explored for potential negotiation:
  - Visits by and exchanges of faculty members and research scholars
  - Exchange of information including, but not limited to, research publications of faculty members
  - Joint research activities and joint supervision of research work
  - Joint conferences or symposia on subjects of mutual interest
3. It is agreed that the terms and conditions of any agreed programme and activity contemplated in this MoU shall be the subject matter of separate written agreements to be negotiated and agreed upon by both Parties and/or any third parties, wherever applicable. PROVIDED ALWAYS, the decision whether to initiate and/or implement any programme or activity shall be at each party's sole discretion.
4. This memorandum is not intended to create binding or legal obligations on either party. It merely expresses the intentions and understanding of the Parties, which will form the basis of any legally binding agreement to be drafted and executed in the future.
5. Both parties understand and agree that this memorandum creates no financial obligations on either party, and all financial arrangements will have to be negotiated and will depend on the availability of funds.
6. The Parties agree and undertake to keep confidential at all times any confidential information or data that may be exchanged, acquired or shared in connection with any programme or activity conducted pursuant to this MoU save where the same is already in the public domain, obligated by law or otherwise defined in any subsequent agreement on the subject matter.
7. This MoU shall have an initial term of two years ending on 30/06/2025 and will be renewed for another period of three years' term after reviewing the activities performed under this MoU unless written notice by one party to another party for not renewing the MoU is given not later than one (1) month before the expiry of the current term. This MoU may be terminated at any time by mutual written consent or by three (3) months' notice in writing by either party.



8. Every notice, request or any other communication required or permitted to be given pursuant to this MoU shall be in writing, in English and delivered personally or sent by registered or certified post via airmail or by courier or email (which shall be acknowledged by the other Party) to the Parties at the addresses stated below:

**Sardar Vallabhbhai National Institute of Technology, Ichchhanath, Surat-395007, Gujarat, India.**

Attention:

Prof. Anupam Shukla  
Position: Director  
Email: director@svnit.ac.in

**Institute of Nano Science and Technology (INST), Sector-81, Knowledge City, Sahibzada Ajit Singh Nagar, Punjab, Pin - 140306**

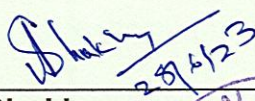
Attention:

Name: Prof. Amitava Patra  
Position: Director  
Email: director@inst.ac.in

**IN WITNESS THEREOF**, the Parties have caused this MoU to be executed by their duly authorized representatives.

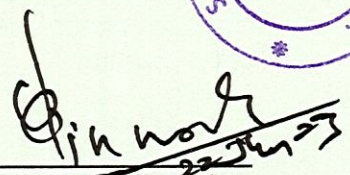
For and on behalf of  
SVNIT, Surat

For and on behalf of  
INST, Mohali


  
**Prof. Anupam Shukla**  
Director  
SVNIT, Surat  
Date: \_\_\_\_\_

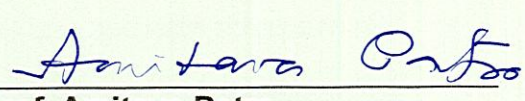


Witness 1. \_\_\_\_\_

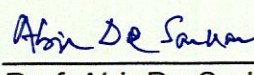
  
Prof. D. C. Jinwala  
Dean (R & C)  
SVNIT, Surat

2. \_\_\_\_\_

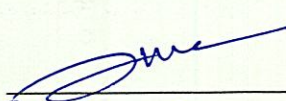
  
Dr. Debesh Roy  
Head, Dept. of Physics  
SVNIT, Surat

  
**Prof. Amitava Patra**  
Director  
INST, Mohali  
Date: \_\_\_\_\_  
Institute of Nano Science & Technology  
(विज्ञान एवं प्रौद्योगिकी विभाग, भारत सरकार का एक स्वायत्त संस्थान)  
(An Autonomous Institute of DST, Govt. of India)  
मोहाली, पंजाब / Mohali, Punjab

Witness 1. \_\_\_\_\_

  
Prof. Abir De Sarkar  
Dean (Faculty)  
INST, Mohali

2. \_\_\_\_\_

  
Prof. Surajit Karmakar  
Dean (R&D)  
INST, Mohali

**डॉ. सुरजीत करमाकर / Dr. Surajit Karmakar**  
प्राध्यापक / वैज्ञानिक 'एफ' / Professor / Scientist 'F'  
नैनो विज्ञान एवं प्रौद्योगिकी संस्थान  
Institute of Nano Science & Technology  
(विज्ञान एवं प्रौद्योगिकी विभाग, भारत सरकार का एक स्वायत्त संस्थान)  
(An Autonomous Institute of DST, Govt. of India)  
मोहाली, पंजाब / Mohali, Punjab