No:Dean(Acad)/IAAC/ 134 /2025-26 **Date: 08/12/2025**

The minutes of the 71st meeting of the Institute Academic Advisory Committee (IAAC)

The aforesaid meeting was held on 5th December 2025, 3:30 pm onwards in the Institute Conference room, first floor, Old Administrative Building. The following members attended the IAAC meeting.

	Chairman		
1	Prof. Anupam Shukla, Director		
	Members		
2	Prof. H. R. Jariwala, Dean (FW)	15	Dr. D. R. Roy, Head, DoP
3	Prof. U. D. Dalal, Dean (A&RG)	16	Dr. J. M. Dhodiya, Head, DoM
4	Prof. J. K. Parikh, Dean (R&C)	17	Prof. A.K. Panchal, Head, DoMS
5	Prof. S. R. Patel, Dean (SW)	18	Dr. K.P. Upla, Asso. Dean (FW)
6	Prof. Ravikant, Dean (P&D)	19	Dr. Rakesh Maurya, Asso. Dean (SW)
7	Prof. Tanmoy Hazra, Head, DoAI	20	Dr. M. K. Rathod, Asso. Dean (SW)
8	Prof. V.N. Lad, Head, DoChE	21	Dr. V. K. Patel, Asso. Dean (Academic)
9	Prof. V.L. Manekar, Head, DoCE	22	Dr. R.D. Shah, Asso. Dean (R&C)
10	Dr. S.J. Patel, Head, DoCSE	23	Dr. N. D. Jariwala, Asso. Dean (P&D)
11	Prof. P. B. Darji, Head, DoEE	24	Dr. V.D. Kalyankar, Asso. Dean (Academic)
12	Dr. Shilpi Gupta, Head, DoECE	25	Dr. H.G. Patel, Asso. Dean (Academic)
13	Prof. K.P. Desai, I/c. Head, DoME	26	Dr. S.K. Sahoo, Asso. Dean (Academic)
14	Prof. B.Z. Dholakiya, Head, DoC	27	Dr. R.K. Jana (Invitee Member)
	Member Secretary		
28	Prof. Ashish Dhamaniya, Dean (Academic)		

The following could not attend the meeting.

1	Dr. Urvashi Kaushal, Head, DoHSS	7	Dr. H. P. Bulsara, Asso. Dean (A&RG)
2	Dr. B. Kondraivendhan, Asso. Dean (FW)	8	Dr. K.C. Kuperkar, Asso. Dean (A&RG)
3	Prof. Y.D. Patil, Asso. Dean (SW)	9	Prof. P.N. Patel, Asso. Dean (R&C)
4	Prof. S. R. Arya, Asso. Dean (P&D)	10	Dr. Abhishek Acharya, Asso. Dean (R&C)
5	Prof. G. R. Vesmawala, Asso. Dean (P&D)	11	Shri Kamlabh Kumar Singh, I/c. Registrar

At the outset, the Chairman, IAAC welcomed all the members present in the meeting. The following agenda items were taken up for the discussion.

Items and Resolutions

Item and Reso.	Agenda Item
Item 71.01	To consider the proposal of not offering the Honours Programme to B.Tech. students for Academic year 2025-26. This recommendation is based on the significant decline in student registration for Honours courses and the constraints related to faculty availability, which have impacted the sustainability of the program. [Ref: Department of Artificial Intelligence Reo. No. 1; DAAC meeting, November 10, 2025].
Reso.71.01	**Resolved to recommend to the Senate the proposal of the Department of Artificial Intelligence to NOT offer the Honours Programme to B.Tech students for the Academic Year 2025–26.**
Item 71.02	To consider the question paper pattern for Kirtee Parida (U22CH011) (Intellectual Disability / Autism Disorder) student of Chemical Engineering. The DAAC recommended, as a special case, that separate question papers be set for Mr. Kirtee Paida, with 50% objective-type questions in each paper, which may include True/False questions, MCQs, matching, or short questions, for subsequent academic years. There shall be no compromise on the standard of the question papers. This arrangement may be reviewed in subsequent academic sessions based on the student's performance. This provision shall be in addition to the existing facility of a scribe during examinations, along with extra time of 20 minutes per hour, as per the provisions of the Rights of Persons with Disabilities Act, 2016 (Resolution No. 62.9 of the 62nd Senate Meeting held on 08/08/2024). [Ref: Department of Chemical Engineering Reso. No. 1; 127th DAAC meeting, September 12, 2025].
Reso.71.02	**Resolved to recommend the proposal of the Department of Chemical Engineering to the Senate to consider the question paper pattern for Kirtee Parida (U22CH011) (Intellectual Disability / Autism Disorder) student of Chemical Engineering.**
Item 71.03	To consider the application received from Safiullah Qais (U19CE076), ICCR student from Afghanistan, for student Bonafide Certificate for apply Visa to Indian Embassy at Kabul. He has completed 6 semesters and 6 years also completed of his B.Tech. [Ref: Department of Civil Engineering Reo. No. 85.1; 85th DAAC meeting, November 3, 2025].
Reso.71.03	The Dean (Academic) office received a request regarding B.Tech.4th year student Safiullah Qais (U19CE076) an ICCR student from Afghanistan, through the Head, Department of Civil Engineering, and seeking permission to allow him to continue his B.Tech. programme. Safiullah Qais was registered in 2019 and successfully completed 6 semesters and completed 6 years of his B.Tech. programme as well. Due to the geopolitical changes in 2021 he is not able to continue his studies as he left to his country. Later the visa services was stopped by the Indian Consulate in Kabul and hence he was not able to travel back to India and continue his B.Tech. His application for visa were rejected since 2021. Now, GoI has taken decision to issue visas to Afghan nationals from Indian Embassy in Kabul. The approval of resumption of his B.Tech. study at the Institute may help him applying for visa and getting it granted for education purpose. **After deliberations, it was;**

	"Resolved to approve the proposal of the Department of Civil Engineering to the Senate to grant permission to Safiullah Qais (U19CE076) to continue his B.Tech. as a Special Case and issued Bonafide Certificate for the same."
Item 71.04	To consider the application of Nishant Sourabh (DS16CE002) working under Dr. P.V. Timbadiya and Dr. P.L. Patel, for continuation of his Ph.D. Programme. Due to certain unavoidable personal and family circumstances, the student had discontinued his Doctoral studies midway. His last semester registration was July to December 2024. (9 years will be completed in December 2025, He has already completed the minimum requirement of paper publications). [Ref: Department of Civil Engineering Reo. No. 86.1; 86th DAAC meeting, November 12, 2025].
Reso.71.04	The Dean (Academic) office received a request regarding Ph.D. student Mr. Nishant Sourabh (DS16CE002) from his Supervisor, Prof. P.V. Timbadiya, through the Head, Department of Civil Engineering, and seeking permission to allow him to continue his Ph.D. programme. Mr. Nishant Sourabh's last semester was July to December 2024. He was absent during both semesters of 2025(January & June) due to unavoidable personal and family circumstances. He has completed the minimum requirement of paper publications in journal for submission of thesis. (9 years will be completed in December 2025), After deliberations, it was; **Resolved to recommend to the Senate that Mr. Nishant Sourabh be granted permission to register for his Ph.D. work in the appropriate semester and to complete the doctoral programme within one year, noting that he has already completed nine years, while the maximum permissible duration for the Ph.D. programme is ten years.** **However, Mr. Nishant Sourabh has to deposit the full fees for all semesters in which he had not registered before the re-registration, as per institute regulations.**
Item 71.05	To note and approve the additional core elective course ANN and Deep Learning (CSDS 126) as Core Elective 3/4 for M.Tech. (Data Science) students and additional core elective course, Artificial Intelligence (CSIS 142) and ANN & Deep Learning (CSIS 144) as Core Elective 3/4 for M.Tech. (Information Security and Privacy) students respectively in the Department of Computer Science & Engineering. [Ref: Department of Computer Science & Engineering Reo. No. 3; DAAC meeting, October 3, 2025; Annexure 71.05].
Reso. 71.05	**NOTED and APPROVED**
Item 71.06	To note and approve the additional core elective course, Large Language Models offering to B.Tech IV (7th semester) students of Department of Computer Science & Engineering. [Ref: Department of Computer Science & Engineering Reo. No. 5; DAAC meeting, October 3, 2025; Annexure 71.06].
Reso. 71.06	**NOTED and APPROVED**
Item 71.07	To consider the recommendation of DAAC of the Department of Computer Science and Engineering, to appoint Prof. S.S. Iyengar, Florida International University, Miami as Distinguished Professor. [Ref: Department of Computer Science & Engineering Reso. No. 1; DAAC meeting, November 24, 2025].
Reso. 71.07	**Resolved to recommend to the Senate the proposal of the *Department of Computer Science and Engineering* to appoint Prof. S. S. Iyengar, Florida International University, Miami, as a Distinguished Professor.**

<table>
<tr><td></td><td>It is further resolved that an honorarium shall be provided to Prof. S. S. Iyengar as per institute's rule.</td></tr>
<tr><td>Item 71.08</td><td>To consider the change of supervisor for M.Tech. students working under the supervision of Dr. K.V. Praveen Kumar, who has resigned from SVNIT and Joined NIT Warangal on 8/10/2025)
<table>
<tr><th>Student Name</th><th>Existing supervisor</th><th>Proposed supervisor</th></tr>
<tr><td>Pankaj Kumar Yadav (P24EL001)</td><td>Dr. K.V. Praveen Kumar</td><td>Prof. Rakesh Maurya</td></tr>
<tr><td>Dhimmar Dipeshkumar Ratilal (P24EL015)</td><td>Dr. K.V. Praveen Kumar</td><td>Prof. Rakesh Maurya</td></tr>
</table>
[Ref: Department of Electrical Engineering Reo. No. 86.4; 86th DAAC meeting, September 26, 2025].</td></tr>
<tr><td>Reso. 71.08</td><td>Resolved to recommend the proposal of, Department of Electrical Engineering to the Senate for the change in supervisor of Mr. Pankaj Kumar Yadav (P24EL001) and Mr. Dhimmar Dipeshkumar Ratilal (P24EL015) of Dr. K.V. Praveen Kumar, who left the Institute on 08/10/2025.</td></tr>
<tr><td>Item 71.09</td><td>To consider to start UG Minor Program on Quantum Technologies at the undergraduate level. Minimum credits to fulfill -18.
[Ref: Department of Mathematics Reo. No. 11.7; 11th DAAC meeting, September 29, 2025; Annexure 71.09].</td></tr>
<tr><td>Reso. 71.09</td><td>Department of Computer Science & Engineering also apply for Minor Program on Quantum Technologies. Hence, Chairman Senate suggested to work in collaboration.</td></tr>
<tr><td>Item 71.10</td><td>To note the Memorandum of Understanding (MoU) between SVNIT Surat and the Indian Institute of Technology, Ropar for the joint Doctor of Philosophy (Ph.D.) degree programme.
The programme enables Ph.D. students enrolled at both institutions to undertake collaborative, multidisciplinary research under the guidance of faculty members and research teams from IIT Ropar and SVNIT Surat, while also benefiting from the academic facilities and professional development opportunities available at both institutes.</td></tr>
<tr><td>Reso. 71.10</td><td>Noted and details are mentioned in Annexure - I</td></tr>
<tr><td>Item 71.11</td><td>To note the Memorandum of Understanding (MoU) between SVNIT Surat and Indian Institute of Technology, Kanpur.
The MoU provides opportunities to UG, PG and, Ph.D. students for internship/research opportunities at IIT Kanpur. Also provides SVNIT faculties for research collobrations.</td></tr>
<tr><td>Reso. 71.11</td><td>Noted and details are mentioned in Annexure - II</td></tr>
<tr><td>Item 71.12</td><td>To prepare the merit list for Non-GATE candidates based on Institute's written test/interview only instead of the merit list based on 50% weightage to aggregate marks of B.E./B.Tech./equivalent degree and 50% weightage to Institute's written test/interview for Institute Spot Round (ISR).</td></tr>
<tr><td>Reso. 71.12</td><td>Item defer</td></tr>
<tr><td>Item 71.13</td><td>The note the proposal received from the Department of Electronics Engineering to appoint Prof. Krishnamachar Prasad, Professor, Department of Electrical and Electronics Engineering, Auckland University of Technology (AUT), Auckland, New Zealand, as Adjunct Faculty at SVNIT for the Odd Semester of AY 2026–27.</td></tr>
</table>

	[Ref: Department of Electronics Engineering Reo. No. 11.7; 102nd DAAC meeting, November 18, 2025].
Reso. 71.13	**Resolved to recommend to the Senate to appoint Prof. Krishnamachar Prasad, Professor, Department of Electrical and Electronics Engineering, Auckland University of Technology (AUT), Auckland, New Zealand, as Adjunct Faculty in the Department of Electronics Engineering at SVNIT for the Odd Semester of AY 2026–27.**
	Item from Chair
Item 71.14	To consider to start M. Tech for working professionals on Hybrid Mode. The M.Tech. program for Working Professionals was approved in the 69th Meeting of the Institute Academic Advisory Council (IAAC) vide Resolution No. 69.19 and subsequently ratified in the 64th Meeting of the Senate vide Resolution No. 64.04. In accordance with these approvals, the Departments of Civil Engineering, Electronics Engineering, Electrical Engineering, and Mechanical Engineering prepared the scheme and syllabus for the program, which were duly approved by the respective departmental bodies. The Institute launched the program in July 2025 and received a total of six (06) applications across all disciplines. However, as per Institute norms, a minimum of ten (10) registered students per program is required for the successful conduct of each program. To enhance participation and attract greater enrollment from working professionals, it is proposed to offer the M.Tech. program in a Hybrid Mode, wherein the theoretical components will be delivered through online classes, while all laboratory sessions and examinations will be conducted in physical, in-person mode only at the Institute campus.
Reso. 71.14	**Resolved to recommend to the Senate the proposal to start the M.Tech programme for Working Professionals in Hybrid Mode.** **Under this mode, the registered working professionals shall attend theory classes in online mode. However, they will be required to attend practical sessions (if any) and appear for examinations in person on campus. It is further resolved that the respective Subject Coordinator, in consultation with the respective Head of Department, may decide to call the registered students in person for a one-week period (or as required) to complete the mandatory practical hours. This entire course will be treated as extra load, apart from the regular teaching load. For all theory courses, renumeration will be paid up to the rate of Rs. 3000/- per hour and for all practical courses up to the rate of Rs. 2000/- per two hours to the concerned faculty. The Director of the institute is empowered to decide the rate of renumeration to the supporting staffs engaged for the same. The visiting faculty will be paid TA/DA as per prevailing norms of the institute.**
Item 71.15	Institute Research Scholars are eligible to receive scholarship for a maximum period of Four years and extendable to Five years subjected to satisfactory progress made by him/her, critical review and recommendation of committee formed by Director.
Reso.71.15	**Resolved to recommend to the Senate to frame a committee to review the students' progress after completion of 4 years and the committee will decide the continuation of scholarship in 5th year. The committee will be constituted by Chairman Senate on recommendation of Dean Academic.**
Item 71.16	To develop a mechanism for less Attendance of students in class will be notified to parents.
Reso. 71.16	**It is reiterated that every student is required to maintain a minimum of 75% attendance in each registered course. In instances where a student's attendance falls below the prescribed limit, his/her parents or guardians shall be appropriately informed.**

	The Class Committee of the respective class shall periodically review attendance records, preferably on a monthly basis, and identify cases of irregular attendance. The Committee shall call upon such students, seek valid justification for the shortfall in attendance, and prepare a report accordingly. This report shall be forwarded to the Office of the Dean (Academic) through the Chairman, DAAC, for further necessary action. **It is also resolved to develop a mechanism in the MIS such that, if a student does not attend classes regularly, an automated SMS or email notification shall be sent to his/her parents/guardians to ensure timely awareness and intervention.**

Member-Secretary, IAAC

Director

M.Tech. I (DS) Semester – II	L	T	P	C
CSDS126 : ANN AND DEEP LEARNING (CORE ELECTIVE 3 OR 4)	3	0	2	4

Course Objective	
1	To introduce the fundamental techniques and principles of Neural Networks
2	To study the different models in ANN and their applications.
3	To explore in depth deep neural architectures for learning and inference and to evaluate the performance of neural architectures in comparison to other machine learning methods
4	To familiarize deep learning concepts with Convolutional Neural Network case studies
5	To implement the concepts of deep learning algorithms and solve real-world problems.

INTRODUCTION TO DEEP NEURAL NETWORKS	**[05 Hours]**
Fundamentals of Neural Networks, Computational models of neurons, Structure of neural networks, Single and multi-layer perceptrons, Learning Methods, Functional units of ANN for pattern recognition tasks, Applications.	
FEEDFORWARD NEURAL NETWORKS	**[06 Hours]**
Pattern classification using perceptron, Multilayer feedforward neural networks, Training Neural Network: Empirical risk minimization, Activation functions, Loss functions, Back propagation learning, Regularization, Model selection and optimization, Auto encoders.	
DEEP NEURAL NETWORKS	**[12 Hours]**
Deep Feed Forward network, Difficulty of training DNNs, Greedy layer wise training, Optimization for training DNNs, Newer optimization methods for neural networks (AdaGrad, RMSProp, Adam), Second order methods for training, Regularization methods: dropout, drop connect, batch normalization.	
CONVOLUTION NEURAL NETWORKS	**[12 Hours]**
Introduction to CNNs – convolution, pooling, Deep CNNs, Different deep CNN architectures – LeNet, AlexNet, VGGNet, GoogLeNet, ResNet. Training CNNs: weights initialization, batch normalization, hyper parameter optimization, Understanding and visualizing CNNs, Applications of CNN– Object Detection, and Content based image Retrieval.	
RECURRENT NEURAL NETWORKS	**[06 Hours]**
Sequence modeling using RNNs, Back propagation through time, Long Short-Term Memory, Bidirectional LSTMs, Bidirectional RNNs, Gated RNN Architecture, Basics of word embedding.	
APPLICATIONS AND TOOLS	**[04 Hours]**
Applications in vision, speech and natural language processing e.g., Image and video captioning along with the use of attention. Deep Learning Tools: Caffe, Theano, Torch.	
Practical Assignments will be based on the coverage of above topics.	**[30 Hours]**
(Total Contact Time: 45 Hours + 30 Hours = 75 Hours)	

List of Practical (Problem statements will be changed every year and will be notified on website.)	
1	Practical based on single layer and multi-layer feed forward Neural Network.
2	Practical based on different activation functions and loss functions.
3	Practical based on back propagation learning algorithm.
4	Implement trained CNN architectures.
5	Implement object detection task using trained CNN models.
6	Practical based on word embedding.
7	Practical based on LSTM.
8	Practical based on GRU.

BOOKS RECOMMENDED

1. S. Haykin, "Neural Networks and Learning Machines" , Prentice Hall of India, 2010.
2. Ian Goodfellow, YoshuaBengio and Aaron Courville, "Deep learning", In preparation for MIT Press, 2016.
3. CharuC.Aggarwal "Neural Networks and Deep learning" Springer International Publishing, 2018.
4. Satish Kumar, "Neural Networks - A Class Room Approach", Second Edition, Tata McGraw-Hill, 2013.
5. Simon Haykin, "Neural Networks, A Comprehensive Foundation", 2nd Edition, Addison Wesley Longman, 2001.

ADDITIONAL BOOKS RECOMMENDED

1. B. Yegnanarayana, "Artificial Neural Networks", Prentice- Hall of India, 1999.
2. Bishop, Christopher M. "Pattern Recognition and Machine Learning". Springer, 2006.
3. Duda R.O., Hart P.E., Stork D.G., "Pattern Classification", Second edition, Wiley-Interscience, 2001.
4. Russell S., Norvig N., "Artificial Intelligence: A Modern Approach", Prentice Hall Series in Artificial Intelligence, 2003.

Course Outcomes At the end of the course, students will	
CO1	be able to understand basic Neural Network architectures, key concepts, issues and practices, core algorithms and optimization when training and modeling with deep architectures.
CO2	be able to apply fundamental principles, theory and approaches for learning with deep neural
CO3	be able to analyze main variants of deep learning architectures, their typical applications.
CO4	be able to evaluate the performance of a different Convolution Neural Networks, LSTM and Gated RNN Architecture
CO5	be able to design real world application based on the concepts of ANN and deep learning.

Detailed Syllabus

M.Tech. I (DS) Semester – II	L	T	P	C
CSIS142 : ARTIFICIAL INTELLIGENCE (CORE ELECTIVE 3 OR 4)	3	0	2	4

Course Objective	
1	To introduce the basic concepts of Artificial Intelligence (AI), with illustrations of current state of the art research, tools and applications.
2	To understand the basic areas of AI including problem solving, knowledge representation, heuristic, reasoning, decision making, planning and statistical methods.
3	To identify the type of an AI problem and apply it for search inference, decision making under uncertainty, game theory etc.
4	To describe the knowledge representation techniques, strengths and limitations of various state-space search algorithms, and choose the appropriate algorithm.
5	To introduce advanced topics of AI such as planning, Bayes networks, natural language processing and Expert systems.

INTRODUCTION TO AI AND INTELLIGENT AGENTS	**[05 Hours]**
Basic concepts of Intelligence, Scope and View of AI, Applications of AI, Turing Test, Intelligent Behavior, Intelligent Agents, AI Techniques, AI-Problem formulation, AI Applications, Production Systems, Control Strategies.	
PROBLEM SOLVING	**[06 Hours]**
Defining the problems as a State Space Search and Production Systems, Production Characteristics, Production System Characteristics, And issues in the Design of Search Programs, Additional Problems. Informed and uninformed search strategies: Generate-And-Test, Breadth first search, Depth first search, Hill climbing, Best first search, A* algorithm, AO* Algorithm, Iterative Deepening Search, IDA*, Recursive Best First Search, Constraint propagation, Neural, Stochastic, and Evolutionary search algorithms, Constraint Satisfaction and Heuristic Repair, Applications.	
KNOWLEDGE REPRESENTATION AND REASONING	**[12 Hours]**
Knowledge representation - Production based system, Frame based system, Knowledge representation using Predicate logic, Introduction to predicate calculus, Rule based representations, Declarative / Logical formalisms, Knowledge bases and Inference, Reasoning in uncertain environments, Logic-Structured based Knowledge representation, Inference – Backward chaining, Forward chaining, Rule value approach, Fuzzy reasoning, Certainty factors, Bayesian Theory-Bayesian Network-Dempster – Shafer theory, Symbolic Logic under Uncertainty : Non-monotonic Reasoning, Logics for non-monotonic reasoning, Statistical Reasoning : Probability and Bayes Theorem, Certainty factors, Probabilistic Graphical Models, Bayesian Networks, Markov Networks.	
GAME PLAYING AND PLANNING	**[12 Hours]**
Introduction, Example Domain: Overview, MiniMax, Alpha-Beta Cut-off, Refinements, Iterative deepening, The Blocks World, Components of a Planning System, Goal Stack Planning, Nonlinear Planning Using Constraint Posting, Hierarchical Planning, Artificial Intelligence, Reactive Systems, Other Planning Techniques, Recent applications.	

MULTI GAME THEORY	[06 Hours]
Introduction, Behavioral game theory: Dictator, Ultimatum and trust games, Mixed strategy equilibrium, Bargaining, Dominant solvable games, Coordination games, Signaling and reputation, Types of learning Reinforcement, Belief, Imitation, Stochastic game theory, Evolutionary games and Markov games for multi-agent reinforcement learning, Economic Reasoning and Artificial Intelligence, Designing games: Cooperative games, Voting, Auctions, Elicitation, Scoring rules, Decision Making and Utility Theory, Adaptive decision making, Analyzing games: Combinatorial games, Zero-sum games, General-sum games, Nash Equilibrium, Correlated Equilibrium, Price of anarchy.	
EXPERT SYSTEMS	**[04 Hours]**
Expert Systems – Architecture of Expert Systems, Roles of Expert Systems – Knowledge Acquisition – Meta Knowledge, Heuristics, Typical Expert Systems – MYCIN, DART, XOON, Expert Systems Shells.	
Practical Assignments will be based on the coverage of above topics.	**[30 Hours]**
(Total Contact Time: 45 Hours + 30 Hours = 75 Hours)	

List of Practical (Problem statements will be changed every year and will be notified on website.)	
1	Introduction to PROLOG programming.
2	Implement Informed and uniformed based search techniques.
3	Implement various algorithms based on game theory.
4	Practical based on fuzzy logic-based application.
5	Practical based on statistical methods.
6	Implement an expert system for real applications.
7	Practical based on multilayer perceptron.
8	Implement neural network-based application

BOOKS RECOMMENDED

1. Stuart Russell and Peter Norvig, "Artificial Intelligence: A Modern Approach", Third edition, Prentice-Hall, 2009.
2. Nils J. Nilsson, "Artificial Intelligence: A New Synthesis", Morgan-Kaufmann, 1998.
3. Elaine Rich and Kevin Knight, "Artificial Intelligence", 2nd Edition, Tata McGraw-Hill, 2003.
4. W. Patterson, 'Introduction to Artificial Intelligence and Expert Systems', Prentice Hall of India,
5. 2010.

ADDITIONAL BOOKS RECOMMENDED

1. Donald A.Waterman, "A Guide to Expert Systems", Pearson Education, 1985, ISBN: 0-201-08313-2.
2. 2. David Poole, Alan Mackworth, "Artificial Intelligence: Foundations for Computational Agents", Cambridge Univ. Press, 2010.
3. J. Han and M. Kamber, "Mining: Data Concepts and Techniques", 3rd Edition, Morgan Kaufman, 2011.
4. Hastie, Tibshirani, Friedman, "The elements of statistical learning", second edition, Springer, 2009.

Course Outcomes At the end of the course, students will	
CO1	be able to understand foundational principles, mathematical tools, program paradigms and fundamental issues, challenges of artificial intelligence, formal methods of knowledge representation, logic and reasoning.
CO2	be able to apply intelligent agents for artificial intelligence programming techniques, Fuzzy logic for problem solving and semantic rules for reasoning and inference to real world problems.
CO3	be able to analyze and formalize the problem as a state space, graph, design heuristics and select amongst different search or game-based techniques to solve them.
CO4	be able to evaluate the performance of an informed and uninformed search strategies, fuzzy
CO5	be able to design the application on different artificial intelligence techniques like heuristic, game search algorithms, fuzzy, expert system and neural network.

Detailed Syllabus

M.Tech. I (DS) Semester – II	L	T	P	C
CSIS144 : ANN AND DEEP LEARNING (CORE ELECTIVE 3 OR 4)	3	0	2	4

Course Objective	
1	To introduce the fundamental techniques and principles of Neural Networks
2	To study the different models in ANN and their applications.
3	To explore in depth deep neural architectures for learning and inference and to evaluate the performance of neural architectures in comparison to other machine learning methods
4	To familiarize deep learning concepts with Convolutional Neural Network case studies
5	To implement the concepts of deep learning algorithms and solve real-world problems.

INTRODUCTION TO DEEP NEURAL NETWORKS	**[05 Hours]**
Fundamentals of Neural Networks, Computational models of neurons, Structure of neural networks, Single and multi-layer perceptrons, Learning Methods, Functional units of ANN for pattern recognition tasks, Applications.	
FEEDFORWARD NEURAL NETWORKS	**[06 Hours]**
Pattern classification using perceptron, Multilayer feedforward neural networks, Training Neural Network: Empirical risk minimization, Activation functions, Loss functions, Back propagation learning, Regularization, Model selection and optimization, Auto encoders.	
DEEP NEURAL NETWORKS	**[12 Hours]**
Deep Feed Forward network, Difficulty of training DNNs, Greedy layer wise training, Optimization for training DNNs, Newer optimization methods for neural networks (AdaGrad, RMSProp, Adam), Second order methods for training, Regularization methods: dropout, drop connect, batch normalization.	
CONVOLUTION NEURAL NETWORKS	**[12 Hours]**
Introduction to CNNs – convolution, pooling, Deep CNNs, Different deep CNN architectures – LeNet, AlexNet, VGGNet, GoogLeNet, ResNet. Training CNNs: weights initialization, batch normalization, hyper parameter optimization, Understanding and visualizing CNNs, Applications of CNN– Object Detection, and Content based image Retrieval.	
RECURRENT NEURAL NETWORKS	**[06 Hours]**
Sequence modeling using RNNs, Back propagation through time, Long Short-Term Memory, Bidirectional LSTMs, Bidirectional RNNs, Gated RNN Architecture, Basics of word embedding.	
APPLICATIONS AND TOOLS	**[04 Hours]**
Applications in vision, speech and natural language processing e.g., Image and video captioning along with the use of attention. Deep Learning Tools: Caffe, Theano, Torch.	
Practical Assignments will be based on the coverage of above topics.	**[30 Hours]**
(Total Contact Time: 45 Hours + 30 Hours = 75 Hours)	

List of Practical (Problem statements will be changed every year and will be notified on website.)	
1	Practical based on single layer and multi-layer feed forward Neural Network.
2	Practical based on different activation functions and loss functions.
3	Practical based on back propagation learning algorithm.
4	Implement trained CNN architectures.
5	Implement object detection task using trained CNN models.
6	Practical based on word embedding.
7	Practical based on LSTM.
8	Practical based on GRU.

BOOKS RECOMMENDED

1. S. Haykin, "Neural Networks and Learning Machines" , Prentice Hall of India, 2010.
2. Ian Goodfellow, YoshuaBengio and Aaron Courville, "Deep learning", In preparation for MIT Press, 2016.
3. CharuC.Aggarwal "Neural Networks and Deep learning" Springer International Publishing, 2018.
4. Satish Kumar, "Neural Networks - A Class Room Approach", Second Edition, Tata McGraw-Hill, 2013.
5. Simon Haykin, "Neural Networks, A Comprehensive Foundation", 2nd Edition, Addison Wesley Longman, 2001.

ADDITIONAL BOOKS RECOMMENDED

1. B. Yegnanarayana, "Artificial Neural Networks", Prentice- Hall of India, 1999.
2. Bishop, Christopher M. "Pattern Recognition and Machine Learning". Springer, 2006.
3. Duda R.O., Hart P.E., Stork D.G., "Pattern Classification", Second edition, Wiley-Interscience, 2001.
4. Russell S., Norvig N., "Artificial Intelligence: A Modern Approach", Prentice Hall Series in Artificial Intelligence, 2003.

Course Outcomes At the end of the course, students will	
CO1	be able to understand basic Neural Network architectures, key concepts, issues and practices, core algorithms and optimization when training and modeling with deep architectures.
CO2	be able to apply fundamental principles, theory and approaches for learning with deep neural
CO3	be able to analyze main variants of deep learning architectures, their typical applications.
CO4	be able to evaluate the performance of a different Convolution Neural Networks, LSTM and Gated RNN Architecture
CO5	be able to design real world application based on the concepts of ANN and deep learning.

B.Tech IV Semester VII
Introduction of Large Language Models
(CORE ELECTIVE - 2/3) *CS481*

Scheme

L	T	P	Credits
3	0	2	4

1. Course Outcomes (COs):
At the end of the course, students will be able to

CO1	Understand the foundational concepts behind large language models, including transformer architectures and tokenization.
CO2	Explore the training processes, data requirements, and scaling laws of LLMs.
CO3	Analyze key LLM capabilities such as in-context learning, few-shot prompting, and fine-tuning.
CO4	Evaluate ethical, societal, and safety challenges posed by LLMs in real-world applications.
CO5	Design, build, and deploy applications using LLMs through APIs and open-source tools like Hugging Face and LangChain.

2. Syllabus

INTRODUCTION **(06 Hours)**

- Evolution of language models: From RNNs to Transformers
- Basic components: tokenization, embeddings, attention mechanisms
- Overview of state-of-the-art LLMs (GPT, BERT and its variants, PaLM, LLaMA)
- Key terminology and concepts (parameters, pretraining, autoregression, etc.)

TRAINING AND SCALING OF LLMs **(08Hours)**

- Pretraining vs fine-tuning
- Dataset collection and preprocessing for LLMs
- Scaling laws and performance trade-offs
- Infrastructure, compute, and optimization challenges
- Instruction tuning and RLHF
- Proximal Policy Optimization (PPO), Direct Preference Optimization (DPO), Group Relative Policy Optimization (GRPO)

LLM CAPABILITIES AND TECHNIQUES **(10 Hours)**

- Prompt engineering: zero-shot, one-shot, few-shot prompting
- In-context learning and reasoning abilities
- Chain-of-Thought (CoT) prompting, Retrieval-Augmented Generation (RAG)
- Fine-tuning and adapter-based methods (LoRA, PEFT)
- Evaluation metrics and benchmarks (MMLU, HELM, etc.)

TOOLS, LIBRARIES, AND FRAMEWORKS **(09 Hours)**

- Hugging Face Transformers, LangChain, OpenAI API
- Tokenizers, vector databases, and prompt templates
- Model serving and deployment (Gradio, Streamlit, FastAPI)
- Experiment tracking and model versioning

SAFETY, ETHICS, AND SOCIETAL IMPACT **(06 Hours)**

- Bias, fairness, and hallucination in LLMs
- Misuse potential and responsible AI practices
- Open vs closed models and alignment challenges
- Regulatory and ethical frameworks

APPLICATIONS AND PROJECTS **(06 Hours)**

- Applications in code generation, customer support, education, and healthcare
- Hands-on mini-projects using LLM APIs and open-source models
- Case studies from real-world deployments
- Capstone project: design and build an LLM-powered application

PRACTICALS **(30 Hours)**

Hands-on labs covering:

- Prompt engineering and model exploration
- Fine-tuning and adapter-based training
- Building conversational agents
- Using LangChain for LLM orchestration
- Evaluating model responses and safety measures

(Total Contact Time: 45 Hours (Theory) + 30 Hours (Lab) = 75 Hours)

---

3. Books Recommended

1. Sowmya Vajjala et al., Practical Natural Language Processing, Wiley, 2024
2. Tanmoy Chakraborty et al., "Introduction to Large Language Models", Wiley, 2024.
3. Lewis Tunstall et al., "Natural Language Processing with Transformers", O'Reilly, 2022
4. Jay Alammar, "The Illustrated Transformer"
5. Hugging Face Documentation – https://huggingface.co/docs
6. Speech and Language Processing, 3rd Edition, Dan Jurafsky and James H. Martin

B. Tech. IV (CSE) Semester – VII Introduction of Large Language Models (CORE ELECTIVE - 2/3) CS4XX	Scheme	L	T	P	Credit
		3	0	2	04

1.	Course Outcomes (COs): At the end of the course, students will be able to
CO1	Understand the foundational concepts behind large language models, including transformer architectures and tokenization.
CO2	Explore the training processes, data requirements, and scaling laws of LLMs.
CO3	Analyze key LLM capabilities such as in-context learning, few-shot prompting, and fine-tuning.
CO4	Evaluate ethical, societal, and safety challenges posed by LLMs in real-world applications.
CO5	Design, build, and deploy applications using LLMs through APIs and open-source tools like Hugging Face and LangChain.

2.	Syllabus	
	Introduction	**(06 Hours)**
	Evolution of language models: From RNNs to Transformers Basic components: tokenization, embeddings, attention mechanisms Overview of state-of-the-art LLMs (GPT, BERT and its variants, PaLM, LLaMA) Key terminology and concepts (parameters, pretraining, autoregression, etc.)	
	TRAINING AND SCALING OF LLMs	**(08 Hours)**
	Pretraining vs fine-tuning Dataset collection and preprocessing for LLMs Scaling laws and performance trade-offs Infrastructure, compute, and optimization challenges Instruction tuning and RLHF Proximal Policy Optimization (PPO), Direct Preference Optimization (DPO), Group Relative Policy Optimization (GRPO)	
	Software Defined Networking	**(10 Hours)**
	Prompt engineering: zero-shot, one-shot, few-shot prompting In-context learning and reasoning abilities Chain-of-Thought (CoT) prompting, Retrieval-Augmented Generation (RAG) Fine-tuning and adapter-based methods (LoRA, PEFT) Evaluation metrics and benchmarks (MMLU, HELM, etc.)	

	TOOLS, LIBRARIES, AND FRAMEWORKS	**(09 Hours)**
	Hugging Face Transformers, LangChain, OpenAI API Tokenizers, vector databases, and prompt templates Model serving and deployment (Gradio, Streamlit, FastAPI) Experiment tracking and model versioning	
	SAFETY, ETHICS, AND SOCIETAL IMPACT	**(06 Hours)**
	Bias, fairness, and hallucination in LLMs Misuse potential and responsible AI practices Open vs closed models and alignment challenges Regulatory and ethical frameworks	
	APPLICATIONS AND PROJECTS	**(06 Hours)**
	Applications in code generation, customer support, education, and healthcare Hands-on mini-projects using LLM APIs and open-source models Case studies from real-world deployments Capstone project: design and build an LLM-powered application	
	Practicals will be based on the coverage of the above topics separately.	**(30 Hours)**
	(Total Contact Time: 45 Hours + 30 Hours = 75 Hours)	

3.	**Practical**
1	Prompt engineering and model exploration
2	Fine-tuning and adapter-based training
3	Building conversational agents
4	Using LangChain for LLM orchestration
5	Evaluating model responses and safety measures

4.	**Books Recommended**
1.	Sowmya Vajjala et al., Practical Natural Language Processing, Wiley, 2024
2.	Tanmoy Chakraborty et al., "Introduction to Large Language Models", Wiley, 2024.
3.	Lewis Tunstall et al., "Natural Language Processing with Transformers", O'Reilly, 2022
4.	Jay Alammar, "The Illustrated Transformer"
5.	Hugging Face Documentation – https://huggingface.co/docs
6.	Speech and Language Processing, 3rd Edition, Dan Jurafsky and James H. Martin

Course Structure of UG Minor Program on Quantum Technologies

Preamble:

Quantum technology is an emerging new paradigm that promises to disrupt and revolutionize computing, communication and sensing in the coming decades. Keeping in mind the immense strategic potential, and possibilities for unforeseen breakthroughs in research, the global investment from Governments alone exceeds 40 B$. In the Indian context, the National Quantum Mission from the Government of India is a decisive step in accelerating the nation's research in this field. To fulfil the mandates of the mission, India needs to develop a highly skilled workforce through immediate initiatives in teaching and training. The training imparted to this workforce must enable them to reach global standards, and simultaneously address the multi-disciplinary needs of quantum technology development -- from core hardware and back-end engineering support to algorithms for cryptography and machine learning. To create a thriving quantum-trained ecosystem in India it is thus imperative to introduce a dedicated curriculum at the undergraduate level, as well as at the post graduate level, along with programmes for faculty members and teachers involved in undergraduate and post graduate education. While institutes of national importance have begun programs to this end, expanding such training to a larger pool of institutes across the country enables the nation to tap into the vast resource of students who can then participate in the mission to accelerate its progress towards its goals.

In this context we propose the course structure **for a minor program in Quantum Technologies at the undergraduate level.**

Here we consider Quantum Technologies to include all four verticals

- Quantum computation and simulation,
- Quantum communications and cryptography,
- Quantum sensing,
- Quantum materials and devices.

We propose a curriculum spanning a minimum of 18 credits. We propose both theory and lab courses in this curriculum. We assume each course amounts to 3 credits (1 credit translating to 1 in-class contact hour per week for a theory course or 1 session of lab for 2 hours for a lab course), thereby making the minor program span a minimum of 6 courses. We propose a pool of courses amounting to 30+ credits, out of which any given institution may choose 18 credits depending on the availability of teachers in that institution. However, to retain the core mandate of the minor, we propose to make a couple courses mandatory. This flexibility in the curriculum, we believe, will allow institutions to readily start training students in one or more verticals of quantum technologies. We also believe that many of the listed courses may also be chosen as electives by students who do not opt for a minor in quantum technology. We also encourage students to incorporate project-based learning approaches wherever possible to enhance the impact of the curriculum.

We have designed the curriculum keeping in mind the diversity in the institutions, as well as the different engineering disciplines. We believe that this minor program can be taken up by students of ALL engineering disciplines from their third or fourth semester (assuming an 8 semester or 4-year undergraduate program as the standard format). The students undertaking this course need to be familiar with basic engineering mathematics (basic linear algebra, complex numbers, probability and statistics) and physics at high school level (newton's laws, optics, thermodynamics), along with the basics of programming (simple arithmetic operations, basic sorting and search algorithms). These basic prerequisites are easily met by most students after their first year of undergraduate engineering/science education. We designed the curriculum to contain a quick review of all the requisite basics to acknowledge the possibility that some students may not have them covered and still want to pursue this minor.

We believe that extensive training programs for teachers are necessary to enable them to do justice to the goals of the minor program. Such sustained teacher training efforts will also enhance the quality of the training imparted to students over the years leading to long-term benefits and enable India to become a world leader in this field. We also believe that a text-book writing exercise should be carried out, such that topics in quantum technologies

Proposed structure of the program:

Minimum credits to fulfil – 18

- A 3:0 course amounts to at least 36 hours of lectures (considering holidays, exam days etc) per semester, assuming an average length of 14 weeks for the semester.
- A **n:m** lab course has **n** hours of lectures and **m** sessions (2 hours each) of lab per week.
- The proposed course structure is only to provide a guideline. Based on the available teaching resources, an institute may choose to add more modules, having covered the ones mentioned here.
- Project Based Learning (PBL) is encouraged and institutes must try to incorporate projects related to the domain of the minor degree wherever possible.

Table of Courses

Course code	Title	Credits (Theory: Lab)	Course Coordinators
QT00, QT 01 and QT 02 are both Mandatory			
QT00	Foundations of Quantum Computing: Physics, Engineering, and Mathematics Computing	3.0	**RKJ/LKS**
QT 01	Survey of Quantum technologies and Applications	3:0	**LKS/ASM/VG**
QT 02	Foundations of Quantum Technologies	3:0	**LKS/ASM/VG**
At least one of QT 03 and QT 04 is Mandatory			
QT 03	Basic Programming Lab	2:1	**RKJ/ LKS**
QT 04	Basic Laboratory Course for Quantum Technologies	2:1	**LKS/ASM/AS/VG**
At least one of QT 05, QT 06, QT 07, QT 08 is Mandatory			
QT 05	Introduction to Quantum Computation	3:0	**RKJ/AB/SP/VG**
QT 06	Introduction to Quantum Communication	3:0	**ASM/VG**
QT 07	Introduction to Quantum Sensing	3:0	**VG/ASM**
QT 08	Introduction to Quantum Materials	3:0	**AS/ LKS**
Optional / Additional Courses			
QT 09	Engineering Foundations of Quantum Technologies	3:0	**ASM/VG/AB**
QT 10	Solid State Physics for Quantum Technologies	3:0	**LKS / AS**
QT 11	Quantum Optics	3:0	**LKS/ASM/VG**

RKJ- Dr. R. K. Jana, DoM; **LKS**- DR. L. K. Saini, DoP; **ASM**-Dr. A. S. Mondloi, DoECE; **AS**-Dr. A. Sivaiah, DoC; **VG**-Dr. V. Gupta,DoECE; **AB**-Dr. A. Bhattacharya, DoCSE, SP-Dr. S. Patel, DoCSE.

Any student of B. Tech. / Integrated M. Sc. / Integrated M. Tech. courses can opt for minor program in Quantum Technologies as per the following:

Semester-III	**Semester-IV**
QT00 and QT 01	QT02 and QT03 / 04
Semester-V	**Semester-VI**
QT05 / 06 / 07 / 08	QT09 / 10 / 11

Initially, **minimum 10 students** and **maximum 60 students** may be allowed in each course. The **details of each courses** are attached in the next page onwards as per Institute format.

QT00: Foundations of Quantum Computing

L	T	P	Credit
3	0	0	03

1. Course Outcomes (COs)

At the end of the course, students of this course learn

CO1: The necessary mathematical tools of linear algebra.

CO2: Classical mechanics, Hamiltonian and Lagrangian Mechanics

CO3: The basics of statistics and probability

CO4: The fundamentals of Electromagnetic theory

CO5: Basics of Computer Architecture, Digital Logic and Circuits

2. Syllabus

- **LINEAR ALGEBRA** **(12 Hours)**
  Vectors and Vector Spaces, Linear Transformations, Complex Vectors and Matrices, Eigenvalues and Eigenvectors, Inner Product Spaces, Orthogonality and Hilbert Spaces, Diagonalization, Applications to Quantum computing.

- **PROBABILITY AND STATISTICS** **(9 Hours)**
  Introduction to Statistics, Data Representation, Descriptive Statistics, Probability, Random Variables and Probability Distributions, Specific Probability Distributions and the Central Limit Theorem.

- **HAMILTONIAN AND LAGRANGIAN MECHANICS** **(6 Hours)**
  Classical Mechanics Overview, Lagrangian Formulation, Hamiltonian Mechanics, Applications to Quantum Mechanics.

- **ELECTROMAGNETIC THEORY** **(6 Hours)**
  Introduction to Electromagnetic Theory, Maxwell's Equations, Maxwell equation in phasor form, Electromagnetic Wave, Wave propagation in free space, Wave propagation in conducting medium, Rectangular waveguides, Electromagnetic Waves in Different Media (dielectric, conducting), Quantization of EM waves, Electromagnetic wave in optical fibre.

- **COMPUTER ARCHITECTURE BASICS** **(6 Hours)**
  Principles of Computer Design, Basic Computer organization, Von Neumann Architecture, Microprocessor, Memory Hierarchy.

- **DIGITAL LOGIC AND CIRCUITS** **(6 Hours)**
  Digital Numbers representation, Introduction to Digital Logic Gates, Boolean Algebra and Simplification, Combinational Circuits.

Total Lecture Hours: 45

3. Books Recommended

1. B. Kolman and D. A. Hill, Elementary Linear Algebra with Applications, Pearson New International Edition, 2013.
2. R. Larson, Elementary Statistics: Picturing the World, Pearson, 8th edition, 2023.
3. H. Goldstein, Classical Mechanics, Addison Wesley Publisher, 3rd edition, 2000.
4. J. D. Griffiths, Introduction to Electrodynamics, Cambridge University Press, 4th edition, 2020.
5. M. Morris Mano, Computer system architecture,3rd ed., Prentice Hall, Inc. USA.

Extra Books

6. T. L. Floyd, Digital Fundamentals, 11th Edition, Pearson Publication
7. M. Morris Mano, Digital Logic and Computer Design, Pearson Publication

QT01: Survey of Quantum Technologies and Applications

L	T	P	Credit
3	0	0	03

1. Course Outcomes (COs)

At the end of the course, students of this course learn

CO1: Learn about the general physical principles of realising qubits for computation
CO2: Learn about the various hardware implementations of qubits for computation
CO3: Learn about the basic ideas of quantum sensing
CO4: Learn about the applications of quantum sensing
CO5: Learn about the implementations of quantum communications protocols in fibre-based and free-space

2. Syllabus

- **QUANTUM TECHNOLOGIES** **(3 Hours)**
  Motivation for Quantum Technologies. Four Verticals- Quantum computation and simulation, Quantum communications and cryptography, Quantum sensing and Quantum materials and devices.

- **QUANTUM PHYSICS** **(9 Hours)**
  Quantum States, Wavefunctions, Probabilistic interpretation, Physical observables, Hermitian operators, expectation values, Heisenberg uncertainty principle, Schrodinger equation, Time evolution, distinction from classical physics, Heuristic description of Superposition, Tunnelling and entanglement, No cloning theorem, Simulating classical systems – Feynman's idea of a quantum simulator and the birth of the field.

- **QUANTUM COMPUTATION** **(12 Hours)**
  Basics of qubits -- what is a qubit? How is it different from a classical bit? Review of classical logic gates, Di Vincenzo criteria for realising qubits, Basics of qubit gates and quantum circuits, Physical implementation of qubits (very qualitative description). Solid State Qubits, Semiconducting Qubits – quantum dots, spins, Superconducting Qubits – charge, flux and phase, Topological Qubits – proposals and advantages. Atoms and Ions - Trapped ions, Rydberg atoms, Neutral atoms, Photonic Qubits - Conventional linear optical l setups, Integrated Photonics, NMR qubits - Conventional NMR qubits, NV centers. Overview of applications and recent achievements: RSA and Shor's algorithm, Quantum Advantage, Long term goals and strategies being followed: Error correction.

- **QUANTUM SENSING** **(10 Hours)**
  Basics of quantum sensing, Basics of Photon (single and entangled) generation and detection, Gravimetry, Atomic clock, Magnetometry, State of the art in Quantum Sensing,

- **QUANTUM COMMUNICATIONS** **(11 Hours)**
  Basics of digital communication, Quantifying classical information – Shannon entropy, Basic ideas of quantum communication, security, eavesdropping, Overview of quantum communication achievements: Terrestrial – fibre-based, Free space, Satellite-based.

Total Lecture Hours: 45

Course Coordinator(s): LKS/ASM/VG

3. Books Recommended

1. R. Manenti and M. Motta, Quantum Information Science, 1st Edition, Oxford University Press, 2023.
2. M. A. Nielsen and I. L. Chuang, Quantum computation and quantum information, 10th edition, Cambridge University Press, 2010.
3. A. Pathak, Elements of Quantum Computation and Quantum Communication, CRC Press, Boca Raton, 2015.
4. R. Laflamme, M. Mosca and P. Kaye, An Introduction to Quantum Computing, Oxford University Press, 2006.
5. D. McMahon, Quantum computing explained, John Wiley & Sons, Inc., New Jersey, 2008.

QT02: Foundations of Quantum Technologies

L	T	P	Credit
3	0	0	03

1. Course Outcomes (COs)

At the end of the course, students of this course learn

CO1: The most relevant mathematical techniques
CO2: Basic postulates of quantum mechanics and applications
CO3: Basics of Statistical Physics
CO4: Basics of Information Science
CO5: Basics of computational complexity

2. Syllabus

- **QUANTUM MECHANICS** **(18 Hours)**
  Brief overview of classical physics, Historical evolution of quantum mechanics, Postulates of Quantum Mechanics, Density operator formalism of quantum mechanics - pure and mixed states, Superposition and Entanglement in quantum mechanics, No cloning theorem, Applications of postulates - Particle in a box, Hydrogen atom, Harmonic Oscillator, Number states, ladder operators and Coherent states of a harmonic oscillator, Spin and Angular momentum - spin half particles, Rabi problem of a spin-half particle in a rotating magnetic field, Bosons and Fermions.

- **STATISTICAL PHYSICS** **(11 Hours)**
  First and second laws of thermodynamics, Thermal Equilibrium and Gibbs principle, Gibbs principle for Classical and Quantum harmonic oscillators, Bosons and Fermions and Quantum statistics - Fermi-Dirac and Bose-Einstein distributions.

- **INFORMATION SCIENCE** **(7 Hours)**
  Digital communication and information, Basic idea of quantum information, Decoherence and noise, Introductory ideas of Kraus operators.

- **BRIEF OVERVIEW OF COMPUTATIONAL COMPLEXITY.** **(9 Hours)**
  Quantitative ideas of a Turing machines, Time and Space complexity – P vs NP, PSPACE, Quantum complexity classes – Q, EQP, BQP, BPP, QMA, Post Quantum Cryptography (PQC).

Total Lecture Hours: 45

3. Books Recommended

1. D. J. Griffiths, Introduction to Quantum Mechanics, Cambridge University Press, 3rd edition, 2024.
2. D. J. Griffiths, Introduction to Electrodynamics, Cambridge University Press, 4th edition, 2020.
3. R. Shankar, Principles of Quantum Mechanics, Springer, 2nd edition, 2014.

Course Coordinator(s): LKS/ASM/VG

4. R. Manenti and M. Motta, Quantum Information Science, Oxford University Press, 1st edition, 2023.
5. M. A. Nielsen and I. L. Chuang, Quantum computation and quantum information, Cambridge University Press, 10th Anniversary edition, 2015.

Extra Books

6. A. Pathak, Elements of Quantum Computation and Quantum Communication, Boca Raton, CRC Press, 2015.
7. M. Sisper, Introduction to the Theory of Computation, Cengage India Pvt. Ltd., 3rd edition, 2014.
8. R. K. Pathria and D. B. Paul, Statistical Mechanics, Academic Press, 4th edition, 2021.

QT03: Basic Programming Lab

L	T	P	Credit
2	0	1	03

1. Course Outcomes (COs)

At the end of the course, students of this course learn

CO1: Basics of programming
CO2: To write programs to solve scientific problems
CO3: Techniques for scientific computing
CO4: Applications to quantum mechanics
CO5: Applications to electromagnetism

2. Syllabus

- **BASICS OF PROGRAMMING** **(7 Hours)**
  Data structures, classes, Data storage and retrieval, Memory allocation, Scientific plotting, documentation of codes.

- **SIMPLE ALGORITHMS AND BENCHMARKING RUN TIME** **(6 Hours)**
  Sorting, Searching, Arithmetic algorithms like GCD, Prime factorization.

- **NUMERICAL INTEGRATION AND DIFFERENTIAL EQUATIONS** **(8 Hours)**
  Linear 2nd Order ODEs with constant coefficients, Linear 2nd order ODEs with variable coefficients, Boundary value problems- Poisson equation, Laplace equation, Wave equation, Diffusion Equation.

- **NUMERICAL TECHNIQUES IN LINEAR ALGEBRA** **(6 Hours)**
  Matrix inverse, Eigenvalue problem, Diagonalisation of matrices, Singular value decomposition.

- **NUMERICAL TECHNIQUES IN PROBABILITY, STATISTICS** **(6 Hours)**
  (Pseudo) Random number generation, Computing statistical moments for data samples, Least Squares fitting, Error Analysis, Hypothesis Testing, Monte Carlo sampling.

- **APPLICATIONS TO QUANTUM MECHANICS** **(6 Hours)**
  Eigen energies of coupled two level systems, Eigen energies of two-level system coupled to oscillator (Jaynes-Cummings Model), Driven two-level system – Rabi Problem, Driven damped oscillator — coherent states.

- **APPLICATIONS TO ELECTROMAGNETIC THEORY** **(6 Hours)**
  Electrostatic charge distributions, Magnetostatic current distributions, Finite Element techniques for electromagnetic simulations

Total Lecture Hours: 45

3. Books Recommended

1. N. Giordano and H. Nakanishi, Computational Physics, 2nd edition, Pearson-Addison Wesley, 2005.

Course Coordinator(s): RKJ/ LKS

QT04: Basic Laboratory Course for Quantum Technologies

L	T	P	Credit
2	0	1	03

1. Course Outcomes (COs)

At the end of the course, students of this course learn

CO1: Learn basic experimental techniques in optics
CO2: Learn basic experimental techniques in characterizing resonators and RLC circuits.
CO3: Learn basic digital circuits
CO4: Learn fundamental techniques in RF engineering.
CO5: Learn interfacing instruments with computers and carry out data acquisition.

2. Syllabus

- **OPTCIS** **(8 Hours)**
  Interferometry – wavelength measurements, intensity measurements, Diffraction –single slit, grating, Microscopy – magnification, aberration, Polarization optics – PBS, HWP, QWP.

- **RLC CIRCUITS** **(6 Hours)**
  Series and parallel RLC circuits – Verifying the quality factor formulae, Extracting intrinsic losses.

- **DIGITAL CIRCUITS** **(6 Hours)**
  Adder, Multiplier, Encoder, Decoder, D flipflop, shift registers, How to use common Integrated Circuit chips.

- **RADIO FREQUENCY TECHNOLOGY** **(11 Hours)**
  Using Oscilloscope, Ring-up and ring-down time measurements of RLC circuits, Measurements of different pulse-shapes generated by a function generator, Using Vector Network Analyser, Transmission and reflection measurements of coaxial cable, VSWR measurement, Amplitude and Phase quadrature plots and Quality factor measurement of RLC circuits, Characterising S-parameters, ABCD and Z matrices of common 2-port networks – coaxial cable, attenuator, low pass/high pass/bandpass filters, Characterising 3-port networks – directional couplers, circulators, isolators, Using a spectrum analyser, Noise from a resistor at different temperatures.

- **DATA ACQUISITION AND INSTRUMENT INTERFACING** **(7 Hours)**
  Interfacing instruments with a computer, Signal demodulation – heterodyne vs Homodyne, Sampling, digitisation using ADCs, Averaging and interpolation techniques.

- **QUANTUM SIMULATORS** **(7 Hours)**
  Digital Numbers representation, Introduction to Digital Logic Gates, Boolean Algebra and Simplification, Combinational Circuits. Running simple algorithms on cloud-based quantum processors.

Total Lecture Hours: 45

Course Coordinator(s): LKS/ASM/AS/VG

3. Books Recommended

1. E. Hecht, Optics, 5th edition, Pearson Global, Essex, England, 2017.
2. P. Horowitz and W. Hill, Art of Electronics, 3rd edition, Cambridge University Press, 2015.
3. M. Mano, M. D. Cilletti, Digital Design, 6th edition, Pearson Education, 2018.
4. D. Pozar, Microwave Engineering, 4th edition, Wiley, 2013.
5. A. V. Oppenheim and R. W. Shaffer, Discrete-time Signal Processing, 4th edition, Pearson, 2009.

4. Extra Book

6. A. Pathak and A. Banerjee, Optical quantum information and quantum communication, SPIE Spotlight Series, SPIE Press, 2016.

	L	T	P	Credit
QT05: Introduction to Quantum Computation	3	0	0	03

1. Course Outcomes (COs)

At the end of the course, students of this course learn

CO1: The theoretical basics of qubits and their physical realisations
CO2: To work with density operators and time evolution for mixed states
CO3: The basic ideas of quantum gates
CO4: The working of important quantum algorithms
CO5: The basics of quantum error correction

2. Syllabus

- **QUBITS VERSUS CLASSICAL BITS** **(8 Hours)**
  Spin-half systems and photon polarizations, Trapped atoms and ions, Artificial atoms using circuits, Semiconducting quantum dots, Single and Two qubit gates – Solovay-Kitaev Theorem, Quantum correlations, Entanglement and Bell's theorems.
- **REVIEW OF TURING MACHINES AND CLASSICAL COMPUTATIONAL COMPLEXITY** **(8 Hours)**
  Time and space complexity (P, NP, PSPACE), Reversible computation, Universal quantum logic gates and circuits.
- **QUANTUM ALGORITHMS** **(8 Hours)**
  Deutsch algorithm, Deutsch Josza algorithm, Bernstein - Vazirani algorithm, Simon's algorithm, Database searc-Grover's algorithm,. Quantum Fourier transform and prime factorization- Shor's Algorithm, Quantum complexity classes – Q, EQP, BQP, BPP, QMA.
- **ADDITIONAL TOPICS IN QUANTUM ALGORITHMS** **(7 Hours)**
  Variational Quantum Eigensolver (VQE), Harrow-Hassidim-Lloyd algorithm (HHL), Quantum Approximate Optimization Algorithm (QAOA).
- **INTRODUCTION TO ERROR CORRECTION** **(7 Hours)**
  Fault-tolerance, Simple error correcting codes.
- **SURVEY OF CURRENT STATUS** **(7 Hours)**
  NISQ era processors, Quantum advantage claims, Roadmap for future.

Total Lecture Hours: 45

3. Books Recommended

1. R. Manenti and M. Motta, Quantum Information Science, 1st Edition, Oxford University Press, 2023.
2. M. A. Nielsen and I. L. Chuang, Quantum computation and quantum information, 10th Anniversary edition, Cambridge University Press, 2010.
3. A Pathak, Elements of Quantum Computation and Quantum Communication, CRC Press, Boca Raton, 2015.

Course Coordinator(s): RKJ/AB/SP/VG

4. F. Gaitan Quantum error correction and Fault tolerant computing, 1st edition, CRC Press, 2008.
5. D. McMahon, Quantum computing explained, Wiley, 2008.

4. Extra Book

6. H. Y. Wong, Introduction to Quantum Computing: From a lay person to a programmer in 30 steps, , 1st edition, Springer-Nature, Switzerland, 2022.

QT06: Introduction to Quantum Communication

L	T	P	Credit
3	0	0	03

1. Course Outcomes (COs)

At the end of the course, students of this course learn

CO1: The basics of Electromagnetic theory
CO2: The basics of photodetection
CO3: The basics of information theory
CO4: The central ideas in quantum communications
CO5: The central ideas in quantum networks

2. Syllabus

- **BASICS OF POLARIZATION OPTICS** **(3 Hours)**
  Quarter and half-wave plates, Polarizing beam splitters.

- **BASICS OF LINEAR AND SQUARE-LAW DETECTORS** **(8 Hours)**
  Quadrature amplitude modulation, Heterodyne and Homodyne demodulation and linear detectors, Intensity measurements and square law detectors, Photomultipliers, Avalanche photo diodes.

- **DIGITAL COMMUNICATION-INFORMATION THEORY** **(7 Hours)**
  Information entropy, Noiseless channel encoding, Noisy channel encoding.

- **QUANTUM COMMUNICATION** **(11 Hours)**
  No cloning theorem, Quantum memories, Quantum repeaters, Entanglement and Bell theorems, Bell measurements and tests, Quantum teleportation protocol, Quantum dense coding.

- **QUANTUM KEY DISTRIBUTION PROTOCOLS** **(6 Hours)**
  BB84, E91, BBM92, B92, COW, DPS.

- **QUANTUM NETWORKS** **(10 Hours)**
  Quantum internet, Survey of hardware implementations: Free space communications, Satellite based communications, Fibre optics-based communications.

Total Lecture Hours: 45

3. Books Recommended

1. M. A. Nielsen, I. A. Chuang, Quantum Computation and Quantum Information, Cambridge University Press, Cambridge, 2010.
2. A. Pathak, Elements of Quantum Computation and Quantum Communication, CRC Press, Boca Raton, 2015.
3. E. Hecht, Optics, 5th edition, Pearson Global, Essex, England, 2017.
4. R. Manenti and M. Motta, Quantum Information Science, 1st Edition, Oxford University Press, 2023.
5. J. G. Proakis and M. Salehi, Digital Communication, 5th Edition, McGraw Hill, New Delhi, 2008.

Course Coordinator(s): ASM/VG

QT07: Introduction to Quantum Sensing

L	T	P	Credit
3	0	0	03

1. Course Outcomes (COs)

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

CO1: Understand classical sensing principles, noise types, and sensitivity limits.

CO2: Explain quantum measurement techniques and standard quantum limits.

CO3: Analyze and characterize quantum states of light.

CO4: Apply quantum detection methods to measure quantum states.

CO5: Evaluate quantum sensing limits and explore their practical applications.

2. Syllabus

- **CLASSICAL SENSING AND NOISE** **(9 Hours)**
  Classical sensing: Photo detection. Classical Noise: Johnson Noise, Telegraph noise, flicker or 1/f noise. Sensitivity of classical measurements: Classical Fisher information and Cramer-Rao bounds.

- **QUANTUM MEASUREMENTS** **(12 Hours)**
  Projective/orthogonal measurements, Approximate/non-orthogonal measurements, Weak continuous measurements, Error-disturbance relations, Standard quantum limits, Quantum non-demolition measurements.

- **QUANTUM STATES AND DETECTION** **(12 Hours)**
  States of light: Fock states, Coherent states, Squeezed states, Tomography, Wigner quasi-probability distribution, P-distribution and Husimi Q function. Quantum photo detection: Square-law detectors, Intensity measurements, Photo-detection, Linear Detectors and Quadrature Measurements.

- **QUANTUM SENSING LIMITS AND APPLICATIONS.** **(12 Hours)**
  Quantum Cramer-Rao bounds, Single photon-based sensing applications, Entanglement based sensing applications, Atomic state-based sensing, solid-state spin-based sensing applications (gravimetry, magnetometry).

Total Lecture Hours: 45

3. Books Recommended

1. H. Wiseman and D. Milburn, *Quantum Measurement and Control*, Cambridge University Press, 2014.
2. V. Braginsky and F. Y. Khalili, *Quantum Measurement*, Cambridge University Press, 1995.
3. R. Manenti and M. Motta, *Quantum Information Science*, Oxford University Press, 1st edition, 2023.

Course Coordinator(s): VG/ASM

4. G. M. D'Ariano, M. G. A. Paris, and M. F. Sacchi, *Quantum Tomography*, Oxford University Press, 2003.
5. V. Giovannetti, S. Lloyd, and L. Maccone, "Advances in quantum metrology," *Nature Photonics*, 5(4), pp.222-229, 2011.

4. Other Reference Books/Materials

1. C. L. Degen, F. Reinhard, and P. Cappellaro, "Quantum sensing," *Reviews of Modern Physics*, 89(3), pp.035002, 2017.

QT08: Introduction to Quantum Materials

L	T	P	Credit
3	0	0	03

1. Course Outcomes (COs)

At the end of the course, students of this course learn

CO1: The basic idea of quantum materials
CO2: The basics of band theory of solids
CO3: The basics of magnetism, superconductivity
CO4: About new 2D materials like graphene, TMDCs
CO5: About topology and topological phases of matter

2. Syllabus

- **BAND THEORY BASICS** **(10 Hours)**
  Metals, Semiconductors and Insulators, Band structure of solids, Survey of semiconducting devices for quantum technologies (electronic, quantum optical devices and principle of operation).
- **CORRELATED SYSTEMS** **(2 Hours)**
- **MAGNETISM** **(5 Hours)**
  Para, ferro magnetism basics, Magnetic measurements, hall effect, magnetoresistance, Faraday and Kerr effects.
- **SUPERCONDUCTIVITY** **(7 Hours)**
  BCS theory, Ginzburg Landau, Josephson Effect – AC and DC Josephson effects, Survey of superconducting devices for quantum technologies.
- **2D MATERIALS** **(5 Hours)**
  Graphene and its properties – single and few layers, Transition Metal Dichalcogenides – Electronic and Optical Properties.
- **TOPOLOGICAL PHASES OF MATTER** **(8 Hours)**
  Basics of Topology, Geometric phases - Berry Phase, Aharonov Bohm effect, Topological phases of matter.
- **SURVEY OF MATERIAL GROWTH TECHNIQUES** **(8 Hours)**
  Molecular beam epitaxy, Chemical vapor deposition, MOVPE, Pulsed laser deposition, etc., Crystal growth techniques.

Total Lecture Hours: 45

3. Books Recommended

1. M. P. Marder, Condensed Matter Physics, 2nd Edition, John Wiley and Sons, 2010.
2. M. Tinkham, Introduction to Superconductivity, standard ed., Medtech, 2017.
3. A.B. Bhattacharya and A. Nag, Engineering Physics, Khanna Book Publishing Co., 2021.
4. D. J. Griffiths, D. F. Schroeter, Introduction to Quantum Mechanics, 3rd Edition, Cambridge University Press, 2018.
5. S. H. Simon, Topological Quantum, OUP, Oxford, 1st edition, 2023.

Course Coordinator(s): AS/ LKS

QT09: Engineering Foundations of Quantum Technologies

L	T	P	Credit
3	0	0	03

1. Course Outcomes (COs)

At the end of the course, students of this course learn

CO1: Relevant topics from Electrical Networks to design and analyse analog circuits

CO2: Relevant topics from RF and Microwave Engineering to design systems

CO3: Relevant topics in the Theory of Computation to benchmark algorithms

CO4: Relevant topics in analog and digital communications

CO5: Basics of cryptography

2. Syllabus

- **ELECTRICAL NETWORKS** **(6 Hours)**
  Analog RLC circuits – resonances, impedances, quality factors, Telegrapher equations, Wave impedance, Impedance matching, Transmission line resonators.

- **COMPUTER SCIENCE** **(15 Hours)**
  Arithmetic Logic Unit, Memory, Finite State Machine, Turing Machines, Overview of Hierarchy of languages – Regular, Context-Free, Turing Decidable and Turing Recognisable, Time and Space complexity, P vs NP, NP-completeness.

- **ELECTRICAL COMMUNICATIONS** **(4 Hour)**
  Analog Communications, Quadrature amplitude modulation, Heterodyne and Homodyne demodulation.

- **NOISE AND SIGNALS** **(8 Hours)**
  Characterising Noise, Types of Noise- Shot Noise, Johnson-Nyquist Noise, Telegraphic noise or flicker or 1/f noise, Signal conditioning and noise mitigation, Amplification and Added Noise, Linear Amplifier theory, Signal-Noise Ratio, Added Noise, Noise Figure of amplification, Dynamic Range, Noise temperature, Quantum limits on noise in linear amplifiers.

- **DIGITAL COMMUNICATIONS** **(5 Hours)**
  Information entropy, Noiseless channel encoding, Noisy channel encoding.

- **BASICS OF CRYPTOGRAPHY** **(7 Hours)**
  Basics of Number Theory, Random Number Generation, One time pad, Private key, Public key, Symmetric and asymmetric cryptography protocols, RSA and DH, Post Quantum Cryptography (PQC).

Total Lecture Hours: 45

3. Books Recommended

1. P. Horowitz and W. Hill, Art of Electronics, , 3rd edition, Cambridge University Press, 2015.
2. M. Mano and M. D. Cilletti, Digital Design, , 6th edition, Pearson Education, 2018.
3. D. Pozar, Microwave Engineering, , 4th edition, Wiley, 2013.
4. R. B. Ash, Information Theory, Dover Publications, 2003.
5. M. Sipser, Introduction to the Theory of Computation, , 3rd edition, Cengage India Pvt. Ltd. 2014.

Extra Books

6. S. Loepp and W. K. Wootters, Protecting Information – From Classical error correction to quantum cryptography, Cambridge University Press, 2006.

QT10: Solid State Physics for Quantum Technologies

L	T	P	Credit
3	0	0	03

1. Course Outcomes (COs)

At the end of the course, students of this course learn

CO1: Basics of solid states physics
CO2: Various approximations for electronic states in matter
CO3: The theory of phonons in solids
CO4: The theory of magnetism
CO5: The theory of superconductivity

2. Syllabus

- **STRUCTURE OF SOLIDS** **(7 Hours)**
  Symmetry, Bravais lattices, Laue equations and Bragg's law, Brillouin Zones, Atomic scattering and structure factors, Characterisation of crystal structures – XRD etc.

- **BONDING IN SOLIDS** **(5 Hours)**
  Van der Waals and Repulsive interactions, Lennard Jones potential, Madelung constant.

- **THE DRUDE THEORY OF METALS** **(6 Hours)**
  DC & AC electrical conductivity of a metal, Hall effect & magnetoresistance, Density of states, Fermi-Dirac distribution, Specific heat of degenerate electron gases,Free electron model.

- **BEYOND THE FREE ELECTRON MODE** **(7 Hours)**
  Kronig-Penney Model, Periodic potential – Bloch Theorem, Band theory, Tight binding model.

- **PHONONS IN SOLIDS** **(6 Hours)**
  One dimensional monoatomic and diatomic chains, Normal modes and Phonons, Phonon spectrum, Long wavelength acoustic phonons and elastic constants, Vibrational Properties- normal modes, acoustic and optical phonons.

- **MAGNETISM** **(6 Hours)**
  Dia-, Para-, and Ferromagnetism, Langevin's theory of paramagnetism, Weiss Molecular theory.

- **SUPERCONDUCTIVITY** **(8 Hours)**
  Phenomenological description – Zero resistance, Meissner effect, London Theory, BCS theory, Ginzburg-Landau Theory, Type-I and type-II superconductors, Flux quantization, Josephson effect, High Tc superconductivity.

Total Lecture Hours: 45

Course Coordinator(s): LKS / AS

3. Books Recommended

1. C. Kittel, Introduction to Solid State Physics, Wiley India Edition, 2019.
2. M. P. Marder, Condensed Matter Physics, John Wiley and Sons, 2010
3. M. Tinkham, Introduction to Superconductivity, Medtech, 2017.
4. A.B. Bhattacharya and A. Nag, Engineering Physics, Khanna Book Publishing Co., 2021.
5. N. W. Ashcroft and N. D. Mermin, Solid State Physics, Brooks, 2021

QT11: Quantum Optics

L	T	P	Credit
3	0	0	03

1. Course Outcomes (COs)

At the end of the course, students of this course learn

CO1: To quantise the electromagnetic field
CO2: The various experimental techniques in photonics
CO3: The various representations of states of light
CO4: Classical, semi-classical and fully quantum models of light-matter interaction
CO5: Modelling decoherence through Master equation

2. Syllabus

- **QUANTIZATION OF THE ELECTROMAGNETIC FIELD (10 Hours)**
  Number states, coherent states, squeezed states, Hanbury-Brown and Twiss experiments – Photon bunching, Photon anti bunching, Hong-Ou-Mandel interference.

- **THEORY OF OPTICAL COHERENCE (9 Hours)**
  Young's double slit experiment and first order coherence, Coherence functions of arbitrary order, Normal ordering, symmetric ordering and ani-normal ordering of operators, Interferometry.

- **PHASE-SPACE REPRESENTATIONS OF STATES OF LIGHT (11 Hours)**
  Wigner distribution, P-function and the notion of non-classicality with some examples of nonclassical states like squeezed states and their applications, Husimi Q function.

- **LIGHT-MATTER INTERACTION (9 Hours)**
  Classical model of light-matter interaction, Semi-classical model of light-matter interaction-, Quantum light-matter interaction, Rabi Model, Jayne's-cummings model.

- **OPEN QUANTUM SYSTEMS (6 Hours)**
  Fermi golden rule, Born-Markov Lindblad Master Equation.

Total Lecture Hours: 45

3. Books Recommended

1. C. Gerry and P. Knight, Introductory Quantum Optics, Cambridge University Press, 2004.
2. D. F. Walls and G. J. Milburn, Quantum Optics, Springer, 2nd Edition, 2008.
3. M. Fox, Quantum Optics: An introduction, , Oxford University Publishers, 2006.
4. Z. Ficek and M. R. Wahiddin, Quantum Optics for Beginners, Jenny Stanford Publishing, 1st edition, 2014.
5. E. Hecht, Optics, 5th edition, Pearson Global, Essex, England, 2017.

Course Coordinator(s): LKS/ASM/VG

Joint Doctoral Degree Program

Between

Indian Institute of Technology Ropar (IIT Ropar)

and

Sardar Vallabhbhai National Institute of Technology, Surat (SVNIT)

AGREEMENT FOR JOINT DEGREE PROGRAM:

DOCTOR OF PHILOSOPHY

Between

Sardar Vallabhbhai National Institute of

Technology, Surat (SVNIT)

and

Indian Institute of Technology Ropar (IIT Ropar)

AGREEMENT FOR JOINT DEGREE PROGRAM: Doctor of Philosophy

THIS AGREEMENT is made on 28/08/2025

BETWEEN:

1. SVNIT, Surat, an educational institution created by an Act of Parliament and having its principal address at **Surat.**

And

2. Indian Institute of Technology Ropar (IIT Ropar), an educational institution created by an Act of Parliament and having its principal address at Indian Institute of Technology Ropar (IIT Ropar), Bara Phool, Punjab 140001, India ("IIT Ropar").

The expression Institution shall mean either IIT Ropar or SVNIT, Surat **Party** means a party to this Agreement and **Parties** means both parties to this Agreement.

WHEREAS:

1. On 28/08/2025 the Parties entered into this Agreement to develop academic and student exchange through a Joint Degree Program (JDP) of Doctor of Philosophy (PhD) whereby students who successfully complete the JDP will be awarded a joint degree for the one thesis with the testamurs/certificates from each Institution clearly indicating the joint nature of the degrees as outlined in Clause 13.

2. By entering into this Agreement, the Parties agree to offer Joint Degree Programs at PhD level in all areas of research in accordance with the terms and conditions set out in this Agreement.

ABBREVIATIONS

ERP: External Registration Program
JDP. Joint Degree Program
PhD: Doctor of Philosophy
DC: Doctoral Advisory Committee
HoD: Head of the Department
JASC: Joint Admissions Sub-committee

NOW IT IS HEREBY *AGREED AS FOLLOWS:*

1. JOINT DEGREE PROGRAM STRUCTURE:

1.1. The program offers PhD students enrolled in both institutions the chance to collaborate on a multidisciplinary research project with faculty members and research teams from IIT Ropar and SVNIT, Surat as well as to take advantage of the facilities and professional development opportunities offered by both institutions.

1.2. Candidates have a "Home Institution" where they begin their studies and spend the majority of time. The expectation is that candidates will spend a minimum of 12 months at the other, "Host" Institution; the timing and duration of this will depend on the program of research but in general will be in the second or third year of the degree. Travel to and study at the Host Institution will be subject to the usual requirements of the institute.

1.3. As a condition of enrolment on the PhD JDP, candidates are required to:

- Spend a minimum of one year* (two semesters) enrolled at each institution
  *Candidates registered as part-time PhD or under External Registration program need to spend the minimum residential requirement criteria of both the institute as mentioned in their ordinances and regulations.
- Undertake a program of progress monitoring and examination that meets the requirements of both institutions
- Comply with the rules, regulations, policies, codes and procedures of both institutions

- Write and submit a thesis for defense by oral examination at the home institution

1.4. Candidates for the PhD JDP will be enrolled in a PhD program in parallel at both institutions. The supervisory team will comprise academics from both institutions who will provide guidance and support throughout the doctoral program. Candidates will benefit from the research community, networking, and collaborations of the IIT Ropar – SVNIT, Surat. Through enrolment at both institutions, candidates will have access to services and support provided at IIT Ropar and SVNIT, Surat including a variety of professional and personal development opportunities for researchers.

1.5. Candidates may have already commenced a PhD at their Home Institution prior to converting in the joint PhD program through enrolment at the Host Institution. In this case, the candidate will be counted from the start date of the original enrolment at the home institution.

1.6. The primary supervisor shall be from the Home Institution. There must be a Joint supervisor from the Host Institution.

1.7. The PhD JDP includes a tailored program of progress monitoring to fulfil the requirements of both institutions. On successful completion of the program requirements, candidates will be awarded a PhD degree jointly by both the Institutions.

2. PROGRAM GOVERNANCE

2.1. The Program is governed by Deanery of Academics of both the institute. The Dean (Academics) will ensure the Program requirements of each institution are upheld and advise on candidature related matters.

2.2. The Program will be operationalized and managed on a day-to-day basis by the office of the Office of Dean, Academics at IIT Ropar and the Office of Dean, Academic Affairs at SVNIT, Surat

- IIT Ropar – Associate Dean (_____) (Email: _____)
- SVNIT Surat- Associate Dean (Academic) (Email: adean_acad@svnit.ac.in)

3. APPLICATION AND ADMISSIONS

3.1. The admissions process will be managed by the IIT Ropar– SVNIT Surat Joint Admissions Sub-committee (JASC) constituted at the School/Department/Centre level and according to each Institution's admissions procedure. Candidates must meet the admissions requirements of both institutions. The eligibility criteria for enrolling in a joint PhD program will be same as that of a regular PhD program/ERP of the individual institute. The details of the same can be found in the PhD ordinance of the individual institute.

- IIT Ropar: https://www.iitrpr.ac.in/
- SVNIT Surat: https://www.svnit.ac.in/web/rules_regulations.php

3.2. JASC will release a call for PhD research projects from prospective supervisors (typically in February and August each year, for the August and January intakes, respectively).

3.3. The projects will be selected on a competitive review basis by the Dean (Academics), based on criteria such as project funding, expected outcomes, supervision capacity and expertise and industry support/involvement.

3.4. Each project on the PhD JDP will have a formal project agreement in place between the two institutions. The format for this agreement is attached as Annexure A.

3.5. The project agreement needs to be signed by the joint supervisors, endorsed by the respective School/Centre/Department Chairs/HoDs and approved by both the institute

3.6. Successful projects will be advertised on both the institute's website to attract potential PhD candidates.

3.7. All applicants will be expected to apply through an online admissions portal. Applicants will be directed to this portal from both the Institute's academic affairs/Admissions website.

3.8. As part of the applications process, applicants may choose up to *N* projects (where *N* is normally 2 or 3). Supervisors from both IIT Ropar and SVNIT Surat will be provided access to this portal to view applications. Each project will specify the base location (IIT Ropar or SVNIT Surat) where funding is available for the project and applicants would also be able to provide their preference for the project.

3.9. Detailed applications from the selected applicants (and aligned with specific projects that have been chosen) will then be reviewed by project supervisors. Based on their own assessments, some (or all) of these applicants for each project will be interviewed by the IIT Ropar and SVNIT Surat supervisors of the project. This interview can be telephonic, *via* videoconferencing, or through a face-to-face meeting, as decided by the supervisors. Supervisors will rank candidates and provide a recommendation of a maximum of *M* preferences (where *M* is usually 2 or 3) for their projects to the JASC.

3.10. Shortlisted applicants will undergo either a written test or a joint interview or both with the JASC. Note that JASC will look at applicant project preferences and also comments from the supervisors subsequent to their conversations with the applicants.

3.11. This admissions process will be reviewed periodically on recommendations that JASC makes to Dean (Academics) for its consideration and approval.

3.12. After each selection round, JASC will submit its recommendations to the Dean (Academics) who will consider these recommendations and forward the recommendations to the Chairman (Senate) of both the institute for approval. Successful applicants will be issued an offer letter by the Host institute, which will be based on the standard offer letters from IIT Ropar or SVNIT Surat. The offer letter should include information on the JDP and the project title/area for which the candidate is recruited, as well as comply with all requirements set forth by the two institutes.

3.13. Offers will always be "conditional offers of candidature". These conditional offers will only be confirmed subject to receipt of original certified transcripts and further documentary evidence as requested by JASC. Students will be required to accept their offer in line with deadlines noted in their offer letter. It is not possible for students to defer commencement of their program; if they are unable to commence on the date stated in their offer letter, they must decline the offer and apply in a future round.

3.14. **Lateral Entry:** For students already at IIT Ropar or SVNIT Surat, they should be enrolled for at least 6 months prior to registration and should include in their submission an approved NOC from IIT Ropar or SVNIT Surat respectively. These candidates do not need to face the JASC for interview. Their applications will be directly put to the Dean (Academics) for consideration and approval.

4. PROJECT AGREEMENTS

4.1. Both the institutes shall enter into a 'Research Project Title agreement' for each individual project/student. This must be completed and signed before an unconditional offer of enrolment into the joint PhD program is made to each applicant under joint supervision. These agreements should detail the financial and resource requirements and intellectual property arrangements for each research project title. This should usually be initiated by the Home Institution using the template in the joint PhD agreement (Annexure A) at the time of releasing advertisement.

4.2. A risk assessment must be undertaken for each project by the supervisory team at each institution, according to their own requirements. In case, any of the supervisor leaves the parent institution due to any reason whatsoever, it will be the responsibility of that institution to arrange the replacement of supervisor from their own faculty. The outgoing faculty member (earlier supervisor) may act co-guide to the maximum possible extent.

5. FEEs, SCHOLARSHIPS AND FUNDING

5.1. The JDP Scholar shall pay tuition fees only to their Home Institution throughout the duration of the JDP including the duration of study at the Partner Institution as per its fee structure.

5.2. Unless otherwise indicated, candidates who wish to be admitted onto the PhD JDP are entitled to receive fellowship meeting the eligibility criteria. The cost of fellowship will be borne by the Home Institute even during the candidate's stay in the Host Institute. No tuition fee will be charged by the host institution. However, the student needs to bear the boarding and lodging charges. Scholarships are awarded based on merit, and the value and conditions of any scholarship awarded will be in accordance with the terms and conditions of the awarding institution.

5.3. Applicants for the PhD JDP may hold any scholarship normally awarded by either institution, subject to the terms and conditions of that scholarship. The number of scholarships available each year and their eligibility may vary.

5.4. In accordance with the Memorandum of Understanding (MoU), both institutions agreed to support up to 15 PhD Joint Degree Program (JDP) scholarships from each university (2025-26). Each academic year's figures could be different. These scholarships are in addition to each institution's regular scholarship cycles and will not count toward a PhD students' specific faculty cap.

5.5. Regardless of the scholarship awarded, students on the joint PhD program will be personally responsible for the following expenses unless otherwise advised:

- Incidental fees and charges at either institution
- Accommodation and living expenses at either institution
- All personal expenses and non-compulsory additional fees at the host institution
- All debts incurred by candidates during their stay at either institution
- Any other debts incurred by candidates during the Joint PhD Program

6. PROGRAM MANAGEMENT

6.1. A Doctoral Advisory Committee (DC) shall be set up for each JDP Scholar to support and monitor progress of the JDP Scholar throughout the candidature until the thesis has been submitted. The DC shall consist of the following members

1. Chair/Head of the School/Department of the Home Institute or his/her nominee	Chairperson
1. Supervisor from the Home institute	Member
2. Supervisor from the Host institute	Member
3. Co-supervisor (s), if any with justification	Member (s)
4. Subject Expert from the Home Institution	Member
5. Additional members may be appointed to meet the requirements	Members

6.2. In case any DC member goes on leave exceeding one-year duration, or resigns or retires from the respective Institution, the respective School/Department/Centre Chair/HoD shall nominate another member following their respective procedures.

6.3. The DC shall meet once a year through video conferencing/ electronic communication. Beyond four years from the time of registration in the program, the DC shall meet every six months until the JDP Scholar's thesis has been submitted in accordance with the rules and regulations of both the Institutions.

7. COURSEWORK REQUIREMENTS

The JDP Scholar shall satisfy the minimum academic coursework requirements of the Home Institution. Additional courses may be taken when recommended by the DC. If a JDP scholar credits a course in one institution, the credits will be automatically transferred to the other institution and will be counted towards the degree requirement.

8. COMPREHENSIVE EXAMINATION AND CONFIRMATION OF PHD CANDIDATURE

The JDP Scholar shall be required to meet the confirmation requirements at the end of the first year of the probationary PhD period (where applicable), and in addition, qualify the comprehensive examination satisfactorily to continue with the JDP. Otherwise, they shall no longer be eligible to participate in the JDP. The comprehensive examination will be as per the prevailing guidelines of the Home Institution.

9. PROGRESS MEETING / SYNOPSIS / THESIS

9.1. JDP Scholars shall normally follow the regulations stipulated by the Home Institution for monitoring their progress. However, submission of synopsis and submission and evaluation of the thesis shall be in line with the requirements of the home Institutions.

9.2. JDP Scholar shall present at least two open seminars in the Home as well as Host Institution. A joint seminar (*via* video conferencing) will also be acceptable.

10. TIME DURATION

10.1. The JDP regular scholar shall spend a minimum of one year at the Host Institution working under the supervision of the joint-supervisor(s). They may take additional courses at the Host Institution as recommended by the DC. The JDP part-time/ERP scholar must fulfil home institution guidelines for ERP student at individual institute. Candidates registered as part-time PhD or under External Registration program need to spend the minimum residential requirement criteria of both the institute as mentioned in their respective ordinances and regulations.

10.2. As far as possible, the minimum and maximum (if applicable) duration of the program will be governed by the rules of both Institutions. In the event of an inconsistency in the durations, the longer duration will apply.

10.3. The JDP Scholar shall be entitled to the leave benefits (if any) that relate to the Institution at which the JDP Scholar is physically located when the leave is requested.

10.4. The JDP scholar is expected to complete their thesis within a maximum duration as prescribed in the ordinance and regulations of the home institute from the date of registration.

11. Ethics approval

All candidates must gain all necessary human, animal and biosafety ethics approvals from both institutions. If either institution does not have the necessary approvals processes, the other institution's approvals process will be used. Candidates will also need to be appropriately inducted in terms of Occupational Health and Safety and any other requirements necessary.

12. WITHDRAWAL AND TERMINATION OF CANDIDATURE

The prevailing regulation for withdrawal including cancellation and termination (for any approved reason, including unsatisfactory progress) of candidature at the JDP Scholars Home Institution shall normally apply in consultation with the Partner Institution. The Home Institution shall notify the Host Institution if the Home Institution intends to terminate the candidature under its policies or if the JDP Scholar has advised the Home Institution of their intention to withdraw from the JDP. In any event, the DC shall advise the JDP Scholar on an appropriate course of action to take, which would be in the best interest of the JDP Scholar.

13. THESIS REVIEW REPORTS & *VIVA VOCE* EXAMINATION

13.1. Evaluation of thesis by external examiners and conducting of the final *viva-voice* examination shall, in general, follow the processes and procedures of the Home Institution.

13.2. The language of the thesis and the *viva voce* examination shall be English.

14. AWARD OF DEGREE

Two separate degree certificates shall be awarded for the one-degree by the respective Institutions in line with their respective protocols/styles. The wording in both degree certificates must indicate unambiguously that the degree is being awarded jointly with the Partner Institution (by name) for the same thesis. Sample certificates are attached as Annexure B to this Agreement/document.

15. INTELLECTUAL PROPERTY, INVENTIONS AND INNOVATIONS

15.1. All intellectual property held by a Party prior to, or outside of, entering into this Agreement that is disclosed or introduced in connection with this Agreement and all materials in which such intellectual property is held, disclosed or introduced ('background intellectual property") shall remain the property of the Party introducing or disclosing it. However, that Party grants the JDP Scholar and/or the other Party a licence to use such intellectual property for any purpose associated with the JDP.

15.2. All rights, titles and interests in any studies, reports or materials, graphic or otherwise, prepared by the Home Institution or by the Partner Institution respectively, that is not background intellectual property or intellectual property created under clause 14.3, will belong to that Institution and may not be made use of except with that Institution's prior written consent.

15.3. Where the Institutions jointly develop intellectual property, inventions and innovations as a result of the research work of the JDP Scholar working under the supervision of the joint supervisors the terms with respect to title and exploitation of such intellectual property, inventions and innovations (including but not limited to trademarks and service marks, copyright, patents, know-how designs and confidential information on the subject of such intellectual property, inventions and innovations) will be negotiated on a case-by-case basis having due regard for each Institutions policies and governance requirements and the terms and conditions imposed by any individual funding agencies or grant-making organizations. The

Parties preference for such case-by- case agreements will be that the intellectual property rights created in the course of the JDP will vest in each Institution in equal shares and that each Party may use such jointly-owned intellectual property for internal, non-commercial research and educational purposes. Save as aforesaid, nothing in this agreement shall be construed as a license or transfer or an obligation to enter into any further agreement with respect to intellectual property currently licensed to or belonging to either Institute.

15.4. Nothing in this Agreement will inhibit the right of a JDP Scholar to have their thesis examined and a copy of their thesis lodged in the library of each Institution (including a digital copy).

15.5. Notwithstanding anything to the contrary in clause 14.3, each JDP Scholar shall own the copyright in his/her thesis.

15.6. The provisions of this clause 14 will survive beyond the termination of this Agreement

16. CONFIDENTIALITY

16.1. When receiving confidential information, the receiving Party must ensure that all employees, students or agents to whom the confidential information is disclosed are bound to keep the confidential information confidential and not to use the confidential information except for the JDP.

16.2. The obligations of confidentiality in this clause 15 do not apply to information which may be required to be disclosed by law, is in the public domain other than by breach of this Agreement or has been independently developed or obtained by the receiving Party.

16.3. Each Party agrees that personal information about JDP Scholars will be collected, managed, held, used, disclosed and transferred in accordance with the relevant privacy laws and policies applicable to that Party.

17. AMENDMENTS

This Agreement may be amended and supplemented in writing at any time by the mutual consent of the Parties in writing.

18. TERM OF AGREEMENT

18.1. This Agreement shall commence on the Effective Date and shall remain in force for a period of five (5) years. Thereafter, it shall renew itself automatically for successive periods of five (5) years unless either Party gives the other Party not less than six (6) months' notice in writing of its desire to terminate this Agreement, at any time during the initial or the relevant extended period.

18.2. Both Parties agree that in the event this Agreement is terminated for any reason, the Parties shall use their best endeavors to allow all JDP Scholars already enrolled in the JDP who are eligible to complete their candidature, to continue and complete the requirements for the JDP in which they are enrolled, and to be awarded the joint degree upon successful completion of the JDP. If it is not possible for a JDP Scholar to satisfy the requirements of and complete the JDP, the Parties shall endeavor to allow that JDP Scholar, at their election, to complete the requirements for a single PhD degree at the Home Institution subject to the requirements of the relevant Institution. The Parties agree that such a JDP Scholar shall be given credit for all relevant units previously undertaken by the JDP Scholar at the other Institution as part of the JDP in accordance with the policies and protocols of the Institution where the JDP Scholar will complete the requirements of their PhD.

18.3. If the Agreement is terminated and if the JDP Scholar continues their candidature either on a Joint degree basis or as a single PhD degree at one or other of the institutions, the Parties agree that the JDP Scholar shall continue to have access to the background intellectual property as described in clause 14.1 and

confidential information to the extent *necessary for* the student to complete the JDP or a PhD at either Institution.

19. DISPUTE RESOLUTION

Any dispute arising under or in connection with this Agreement which cannot be resolved by amicable discussions between the Parties shall be referred to the Director of the respective Parties or their nominees for resolution.

IN WITNESS WHEREOF the parties hereto have caused this Agreement to be duly executed on the day and year first above mentioned.

Annexure A: A1-Project Agreement-IIT Ropar

A2- Project Agreement- SVNIT Surat

Annexure B: Degree certificate format from both the Parties for JDP

Director, SVNIT, Surat निदेशक / DIRECTOR सरदार वल्लभभाई राष्ट्रीय प्रौद्योगिकी संस्थान, सूरत. SARDAR VALLABHBHAI NATIONAL INSTITUTE OF TECHNOLOGY, SURAT. In presence of:	Director, Indian Institute of Technology Ropar
Dean (Academics) SVNIT Surat	Dean (Academics) Indian Institute of Technology Ropar

सरदार वल्लभभाई राष्ट्रीय प्रौद्योगिकी संस्थान सूरत

INDIAN INSTITUTE OF TECHNOLOGY ROPAR
IIT ROPAR
140001
PUNJAB

Annexure A-1

Research Proposal agreement

Between Joint Supervisors

This agreement is made on _____ (the date) at _____ (name of the Institute) between:

SVNIT Surat, Ichchhanath, Surat - 395007, Gujarat, INDIA herein after mentioned as 'Home Institute' through Dr._____ Designation _____ Department/School _____ of SVNIT Surat.

And

Indian Institute of Technology Ropar (IIT Ropar) herein after mentioned as 'Host Institute' through Dr._____ Designation _____ Department/School _____ of IIT Ropar.

We, the above named joint supervisors have agreed as follows:

(1) The Home Institute has finalised a 'Research Proposal Title' in consensus with the Host Institute as _____ _____This title will remain final for the admission of student for PhD under joint supervision.

(2) The title may have some necessary modifications at a later stage which will be done with mutual consent of both joint supervisors to be approved by Dean (Academics) of the Home Institute.

(3) Supervisor at the Home Institute will provide/release advertisement for the admission using template under joint supervision category and will complete all the admission related requirements.

(4) Intellectual property rights of the research proposal title shall be governed and retained as mentioned in the JDP agreement and as per applicable rules of the Home Institute.

(5) Scholarship and other financial assistance if any, shall be extended by the Home Institute.

(6) Provisioning of suitable infrastructural requirements (Class/Lab/Library etc.) during stay at Home/Host Institute shall be taken care at par with other students as per prevailing norms of the Institute.

(7) In case I leave the Institute permanently (due to resignation etc.) or for a longer duration (more than two semesters) for any reason whatsoever, I will ensure that suitable replacement is arranged with the approval of competent authority of my Institute. To the maximum possible extent, I will also act as joint supervisor to accomplish the academic requirements of the students till completion of the enrolled programme.

(8) This undertaking will remain valid till completion of the programme.

(9) In any extreme situation, if the joint supervision cannot be continued, the Home Institute will be responsible for completion of the programme.

(10) I undertake to abide by all other terms and condition of the JDP agreement between both the Institutes for study under joint supervision.

(11) In the event of any dispute of differences arising between the supervisors, decision of the Chairman Senate of the Home Institute will be treated as final.

Signature of the Supervisor	Signature of the Supervisor
Home Institute	Host Institute
Date:	Date:

Countersigned by:

School Chair/Department Head	School Chair/Department Head
Home Institute	Host Institute
Date:	Date:

Dean (Academic)	Dean (Academic)
Home Institute	Host Institute
Date:	Date:

(One copy each to be retained at Home and the Host Institute)

Annexure A-2

Research Proposal agreement

Between Joint Supervisors

This agreement is made on _____ (the date) at _____ (name of the Institute) between:

Indian Institute of Technology Ropar (IIT Ropar) herein after mentioned as 'Home Institute' through Dr._____ Designation _____ Department/School _____ of IIT Ropar.

And

SVNIT Surat, Ichchhanath, Surat - 395007, Gujarat, INDIA herein after mentioned as 'Host Institute' through Dr._____ Designation _____ Department/School _____ of SVNIT Surat.

We, the above named joint supervisors have agreed as follows:

(1) The Home Institute has finalised a 'Research Proposal Title' in consensus with the Host Institute as _____ This title will remain final for the admission of student for PhD under joint supervision.

(2) The title may have some necessary modifications at a later stage which will be done with mutual consent of both joint supervisors to be approved by Dean (Academics) of the Home Institute.

(3) Supervisor at the Home Institute will provide/release advertisement for the admission using template under joint supervision category and will complete all the admission related requirements.

(4) Intellectual property rights of the research proposal title shall be governed and retained as mentioned in the JDP agreement and as per applicable rules of the Home Institute.

(5) Scholarship and other financial assistance if any, shall be extended by the Home Institute.

(6) Provisioning of suitable infrastructural requirements (Class/Lab/Library etc.) during stay at Home/Host Institute shall be taken care at par with other students as per prevailing norms of the Institute.

(7) In case I leave the Institute permanently (due to resignation etc.) or for a longer duration (more than two semesters) for any reason whatsoever, I will ensure that suitable replacement is arranged with the approval of competent authority of my Institute. To the maximum possible extent, I will also act as joint supervisor to accomplish the academic requirements of the students till completion of the enrolled programme.

(8) This undertaking will remain valid till completion of the programme.

(9) In any extreme situation, if the joint supervision cannot be continued, the Home Institute will be responsible for completion of the programme.

(10) I undertake to abide by all other terms and condition of the JDP agreement between both the Institutes for study under joint supervision.

(11) In the event of any dispute of differences arising between the supervisors, decision of the Chairman Senate of the Home Institute will be treated as final.

Signature of the Supervisor	Signature of the Supervisor
Home Institute	Host Institute
Date:	Date:

Countersigned by:

School Chair/Department Head	School Chair/Department Head
Home Institute	Host Institute
Date:	Date:

Dean (Academic)	Dean (Academic)
Home Institute	Host Institute
Date:	Date:

- (One copy each to be retained at Home and the Host Institute)

MEMORANDUM OF UNDERSTANDING
(MoU)

BETWEEN

SARDAR VALLABHBHAI NATIONAL INSTITUTE OF TECHNOLOGY, SURAT

AND

INDIAN INSTITUTE OF TECHNOLOGY KANPUR

FOR

Academic, Research collaboration
&
Students Exchange programmme

Memorandum of understanding ("MoU")

This Memorandum of understanding (**"MoU"**) is made on _____ ("Effective Date") by and between

Indian Institute of Technology Kanpur, a research and educational institution of National importance, established under the Institute of Technology Act, 1961, having its office at P.O. IIT Kanpur, Kalyanpur, Kanpur-208016, Uttar Pradesh (hereinafter called **"IITK"**) on the FIRST PART,

AND

Sardar Vallabhbhai National Institute of Technology, Surat located at Ichchhanath Surat-Dumas, Road, Keval Chowk, Surat, Gujarat 395007 (hereinafter called **"SVNIT"** which expression Shall include its Successors and assignees) on the first part

"IITK" and "SVNIT" shall individually be known as a "Party" and collectively as "Parties".

Introduction

Whereas IITK is one of the premier institutes to provide meaningful education, to conduct original research of the highest standard and to provide leadership in technological innovation for the industrial growth of the country. IITK imparts and undertakes cutting-edge research in various areas of science, engineering, design, management, and humanities.

Whereas SVNIT was established as Sardar Vallabhbhai Regional College of Engineering & Technology (SVRCET) Surat in 1961 as one of the Regional Engineering Colleges (RECs) to impart technical education. The Institute had begun with offering Bachelor Degree Programmes in Civil, Electrical and Mechanical Engineering. The Government of India declared the Sardar Vallabhbhai Regional College of Engineering & Technology (SVRCET) Surat to Sardar Vallabhbhai National Institute of Technology (SVNIT) Surat with status of 'Deemed University' with effect from 4th December 2002. With the enactment of National Institutes of Technology Act-2007, the Institute has been granted the status of 'Institution of National Importance' w.e.f. August 15, 2007

The faculty member(s) of IITK involved in this MoU or in any project specific agreement will receive/disclose Confidential Information on behalf of IITK. He/She/They will execute the obligations of non-disclosure of Confidential Information received from SVNIT.

The Parties agree to work in the areas of Academics and related research, the degree of mutual interest is so great that considerable advantage may be gained from their pursuit on a collaborative basis.

NOW THEREFORE IN CONSIDERATION OF THE MUTUAL COVENANTS, CONTAINED HEREIN, THE PARTIES HERETO AGREE AS FOLLOWS.

1. **SCOPE:**
   The scope of this MoU shall include, but not be limited to the following collaborative activities between IITK & SVNIT:

a) Exchange of students both at under graduate (UG) and post graduate (PG) level for summer research internship programme (SRIP), whereby SVNIT students may undertake research internship at IITK, and IITK students may pursue research internships at SVNIT.
b) Opportunity for UG and PG students of SVNIT to study for a semester at IITK and vice versa, subject to the academic regulations of the respective Institutions.
c) Offering early Ph.D. Programme opportunities by IITK to eligible SVNIT students, in accordance with the academic policies of IITK in vogue.
d) Opportunities for SVNIT faculty members and doctoral students to spend time at IITK for research purposes (1 month or more in a year), subject to applicable norms of IITK and for IITK UG, PG and Ph.D. students to spend time at SVNIT for research activities, subject to the applicable norms of SVNIT.
e) Undertaking of academic and research collaboration in the areas of mutual interest, as may be identified by the Parties from time to time, subject to necessary approvals with respect to each specific activity. Prior to initiating any specific activity or program, the Parties are required work out a specific plan for any activity mentioned above; and mutually discuss the detailed arrangements for collaboration. The terms and conditions for such activity such as deliverables, funding, and intellectual property **will be specified in a separate agreement.**

2. **Intellectual Property Rights:**
   Ownership of any background intellectual property (including but not limited to confidential information, know-how, patents, copyrights, design rights, rights relating to computer software, and any other industrial or intellectual property rights) shall remain **with the Party owning it.**

   Ownership of any intellectual property (including but not limited to confidential information, know-how, patents, copyrights, design rights relating to computer software, and any other industrial or intellectual property rights) developed during the course of this MoU shall be decided **through a separate project specific agreement**.

3. Confidentiality:

   a. Confidential information includes all communication of information disclosed in documentary or tangible form between the Parties, including oral, written and machine-readable form, pertaining to the above which is indicated as confidential. In the case of such information disclosed orally or visually, the disclosing Party shall confirm in writing the facts and general nature of each disclosure within thirty (30) days after it is made.
   b. Confidential information includes information:
      i. Disclosed by or on behalf of the Disclosing Party to the Receiving Party,

2. Otherwise learned or ascertained by the Receiving Party from inspection and/or evaluation of sample(s) identified by the Disclosing Party as confidential and provided to the Receiving Party by or on behalf of the Disclosing Party (s)) and/or,
3. Otherwise learned or ascertained by the Receiving Party from the Disclosing Party.

c. The Receiving Party will not disclose confidential information of the Disclosing Party to any other person and use at least the same degree of care to maintain the information confidential as Receiving Party uses in maintaining as confidential its own confidential Information, but always at least a reasonable degree of care; due diligence will be taken by both the Parties in maintenance of confidential information.
d. The Receiving Party will use confidential information only for the above-mentioned purpose.
e. The Receiving Party will restrict disclosure of the confidential information of the Disclosing Party solely to those employees, subsidiaries, parent and affiliated companies of Receiving Party having a need to know such Information in order to accomplish the purpose stated above.
f. This MoU imposes no obligations on Receiving Party with respect to any portion of the confidential information received from Disclosing Party which:
    1. was known to Receiving Party prior to disclosure by Disclosing Party,
    2. is lawfully obtained by Receiving Party from a third party under no obligation of confidentiality,
    3. is or becomes generally known or publicly available other than by unauthorized disclosure,
    4. is independently developed by Receiving Party,
    5. is disclosed by Disclosing Party to a third party without a duty of confidentiality on the third party.
    6. is required by law or decree.
g. The confidential information shall remain the sole property of the Disclosing Party.
h. The obligation of non-disclosure of confidential information shall survive for 1 year after expiry/termination of this MoU.

4. No Liability:

Neither Party, nor any of their affiliates respective Directors, Deans, officers, employees, subcontractors or agents shall be liable to the other Party for any special, incidental, indirect or consequential damages (including, but not limited to, contract, negligence and tort liability) in connection with or arising out of this MoU.

5. Publicity:

Neither Party shall use the name of the other Party or its employees in any advertisement, press release or publicity with reference to this MoU **without prior written approval** of the other Party, except for necessary governmental disclosures.

6. **Independent Contractors:**
For the purposes of this MoU, the Parties hereto are independent contractors, and nothing contained in this MoU shall be construed to place them in the relationship of partners, principal and agent, employer/employee or joint ventures.

7. **Assignment:**
This MoU shall not be assigned by either Party without the prior written consent of the other, to any third party. In case of any such assignment, the party taking up the assignment shall succeed to the rights, benefits, titles, duties, interest and obligations and liabilities of the Party making such an assignment under the MoU.

8. **Amendment:**
Any amendment or variation to this MoU shall be made by a written MoU between the Parties.

9. **Terms and Termination:**

a. This MoU will remain valid for a period of three (03) years from the Effective Date, upon signatures by the Parties.

b. This MoU may be renewed or extended upon mutual written agreement signed by both the Parties. Either Party may terminate this MoU by providing the other Party with prior written notice of not less than two (2) months mentioning sufficient cause for such termination. Termination or expiry shall not affect any obligations already undertaken by the Parties under this MoU, which shall continue to be binding until their due fulfilment.

c. In case of termination, the Parties shall, through mutual agreement be bound to discharge all obligations in respect of the ongoing studies of students, Ph.D. programmes and joint research program/ projects. Such obligations shall continue in full force and effect until their due completion or until the Parties mutually agree in writing on an alternative arrangement that ensures their proper fulfilment

10. **Force Majeure:**
Neither Party shall be held responsible for non-fulfilment of their respective obligation under the MoU due to the exigency of one or more of the Force Majeure events such as but not limited to Acts of God, War, Flood, Earthquakes, Strike(s), lockout(s), Epidemics, Riots, Civil commotion, etc. provided on the occurrence and cessation of such events, the Party affected by these shall give a notice in writing to the other within one month of such occurrence and cessation. If the Force Majeure conditions continue beyond 6 months, the Parties shall then mutually decide about the future course of action.

11. **Governing law:**
The validity, construction and interpretation of this MoU and the legal relations between the Parties hereto, shall be governed by the laws of India and the courts of Kanpur shall have the exclusive jurisdiction.

12. Dispute Resolution:

Any dispute or difference arising out of or in connection with this MoU shall be settled by the Parties hereto by mutual negotiation. If the matter cannot be resolved in the normal course of business, within ten (10) days after the dispute arises, any interested Party shall give the other Party written notice of any such dispute not resolved, after which the dispute shall be referred to the Director, IITK and the Director, SVNIT Surat who will jointly resolve the dispute in a spirit of independence, mutual respect, and shared responsibility.

In case an amicable settlement of any disputes arising out of or relating to this MoU is not achieved within thirty (30) days after written notice is received, such dispute shall be referred to arbitration under the Rules of Arbitration and Conciliation Act, 1996 (as amended from time to time), by one (01) sole arbitrator appointed in accordance with said Rules. The seat of the arbitration shall be Kanpur. The arbitration shall be conducted in the English language, and the award shall be final and binding upon the Parties. Each Party shall bear its own costs of the arbitration unless the arbitrator otherwise directs.

In witness, thereof the Parties hereto have signed this MoU on the date, month and year written above.

Signed on behalf of

Indian Institute of Technology Kanpur

Name: Ashoke De

Designation: DOAA

Signature: Ashoke De

Date: 28/11/25

ASHOKE DE
DEAN, ACADEMIC AFFAIRS
INDIAN INSTITUTE OF TECHNOLOGY
KANPUR - 208016, INDIA

Signed on behalf of

SVNIT, SURAT

Name: Dr. Anupam Shukla

Designation: Director

Signature:

Date: 28/11/25

निदेशक / DIRECTOR
सरदार वल्लभभाई राष्ट्रीय प्रौद्योगिकी संस्थान, सूरत.
SARDAR VALLABHBHAI NATIONAL INSTITUTE OF TECHNOLOGY, SURAT.