Detailed Project Report for establishing Deemed-to-be University under '*Distinct Category*'

Proposed Name of the University:

New Age Makers' Institute of Technology (NAMTECH)

Submitted to University Grants Commission

Submitted by New Age Education and Skills Foundation (NAESF)

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Glossary

Abbreviation	Full Form
3D	Three Dimensional
ABC	Academic Bank of Credits
ABET	Accreditation Board for Engineering and Technology
ACA	Access and Circulation Area
ADA	Admin Office Area
ADB	Asian Development Bank
AHEP	Accreditation of Higher Education Programs
AI	Artificial Intelligence
AICTE	All India Council for Technical Education
AISHE	All India Survey on Higher Education
AM	Arcelor Mittal
AM/NS	ArcelorMittal Nippon Steel
AMA	Amenities Area
AR	Augmented Reality
ARO	Alumni Relations Office
ASDC	Automotive Skills Development Council
B.E.	Bachelor of Engineering
B.Sc.	Bachelor of Science
B.Tech.	Bachelor of Technology
BHK	Bedroom Hall Kitchen
Bn	Billion
BUA	Built Up Area
CAD	Computer Aided Design
CBCS	Choice Based Credit System
CCTV	Closed Circuit Television
CEO	Chief Executive Officer
CEPT	Centre for Environmental Planning and Technology
CGPA	Cumulative Grade Point Average

Abbreviation	Full Form
CIROS	Context, input, reaction, and output system
CMU	Carnegie Mellon University
COO	Chief Operating Officer
Cr	Crore
CRDF	CEPT Research and Development Foundation
CSIR	Council of Scientific & Industrial Research
CSR	Corporate Social Responsibility
CTO	Chief Technology Officer
DNA	Deoxyribonucleic Acid
DRDO	Defense Research and Development Organization
DXP	Digital Experience Platform
EC	Executive Council
ERP	Enterprise Resource Planning
ESD	Electrostatic discharge
ESG	Environmental, Social and Governance
etc.	et cetera, a Latin phrase meaning **"and other similar things"**
FDI	Foreign Direct Investment
FMEA	Failure Mode and Effects Analysis
FSR	Faculty Student Ratio
GATE	Graduate Aptitude Test in Engineering
GDP	Gross Domestic Product
GRE	Graduate Record Examinations
HEI	Higher Education Institute
HMI	Human Machine Interface
HPC	High Performance Computing
HR	Human Resource
IAS	Indian Administrative Service
ICAR	Indian Council of Agricultural Research
ICMR	Indian Council of Medical Research

Abbreviation	Full Form
ICSSR	Indian Council of Social Science Research
ICT	Information and Communication Technology
IET	Institution of Engineering and Technology
IGBC	Indian Green Building Council
IIM	Indian Institute of Management
IIoT	Industrial Internet of Things
IISc	Indian Institute of Sciences
IIT	Indian Institute of Technology
ILFI	International Living Future Institute
INA	Instructional Area
INCIT	International Center for Industrial Transformation
INR	Indian Rupees
IoT	Internet of Things
IP	Intellectual Property
iPMP	International Professional master's Program
IPR	Intellectual Property Rights
iPTP	International Professional Technologist Program
IQAC	Internal Quality Assurance Cell
IT	Information Technology
ITE	Institute of Technical Education
ITEES	ITE Education Services
ITI	Industrial Training Institute
JNU	Jawaharlal Nehru University
JRF	Junior Research Fellowship
KPI	Key Performance Indicator
L&T	Larsen & Toubro
LEED	Leadership in Energy and Environmental Design
LiFE	Lifestyle For Environment
LMNIIT	LMN Institute of Information Technology

Abbreviation	Full Form
LMS	Learning Management System
LMW	Lakshmi Machine Works
LOA	Letter Of Approval
LoI	Letter of Intent
MBA	Masters in business administration
MD	Managing Director
MES	Manufacturing Execution Systems
MG	Morris Garris
MGI	Morris Garris Motors India
MIS	Management Information System
MIT	Massachusetts Institute of Technology
ML	Machine Learning
Mn	Million
MNC	Multinational Corporation
MoU	Memorandum of Understanding
MSME	Micro, Small and Medium Enterprises
Mt	Metric Ton
MTPA	Million Tonnes Per Annum
NAAC	National Assessment and Accreditation Council
NAESF	New Age Education and Skills Foundation
NASA	National Aeronautics and Space Administration
NASSCOM	National Association of Software and Service Companies
NEP	National Education Policy
NETLAB	Network Laboratory
NGO	Non-governmental organization
NIRF	National Institutional Ranking Framework
NIT	National Institute of Technology
NITI	National Institution for Transforming India
No.s.	Numbers

Abbreviation	Full Form
NRI	Non-Resident Indian
NSDC	National Skill Development Corporation
NSIC	National Small Industries Corporation
NSSI	NAMTECH School of Social Impact
NTPC	National Thermal Power Corporation
OBE	Outcome Based Education
OLI	Open Learning Initiative
OSAT	Outsourced Semiconductor Assembly and Testing
PAL	Personalized Adaptive Learning
PG	Postgraduate
PGPPM	Post Graduate Program in Public Policy and Management
PhD	Doctor of Philosophy
PLC	Programmable Logic Controller
PLI	Production Linked Incentive
PMO	Prime Minister Office
PNW	Purdue University Northwest
PoSH	Prevention of Sexual Harassment
PR	Public Relations
PSU	Public Sector Undertaking
Pvt. Ltd.	Private Limited
QAS	Quality Assurance System
QS	Quacquarelli Symonds
R & D	Research and Development
RDC	Research and Development Cell
SCADA	Supervisory Control and Data Acquisition
SCSC	Search cum Selection Committee
SDG	Sustainable Development Goals
SIRI-COSIRI	Smart Industry Readiness Index - Consumer Sustainability Readiness Index

Abbreviation	Full Form
SIS	Student Information Systems
SOP	Standard Operating Procedure
SPC	Student Placement Committee
Sq.ft.	Square Feet
Sq.Mts.	Square Meter
SQL	Structured Query Language
SRF	Senior Research Fellowship
STEM	Science, Technology, Engineering and Mathematics
TERI	The Energy and Resources Institute
THE	Times Higher Education
TIA	Totally Integrated Automation
TRL	Technology Readiness Levels
TTO	Technology Transfer Office
TUM	Technical University of Munich
TVET	Technical and vocational education and training
UG	Undergraduate
UGC	University Grants Commission
UK	United Kingdom
UK SPEC	UK Standard for Professional Engineering Competence
USA	United States of America
VPN	Virtual Private Network
VR	Virtual Reality
XR	Extended Reality

Executive Summary

About the Sponsoring Body

The New Age Education and Skills Foundation (NAESF), founded by **ArcelorMittal Nippon Steel (AM/NS) India** and **Ramarang Seva Trust**, is a non-profit organization dedicated to societal upliftment through **education and skills development**. As a Section-8 company, NAESF will act as the sponsoring body for a proposed Deemed-to-be University in Gujarat, that will be established under the Deemed-to-be University Regulation 'Distinct Category' 2023. This proposed Deemed-to-be University will focus on addressing **strategic national needs**, **teaching unique disciplines**, and **environmental preservation**.

NAESF's initiative, the New Age Makers' Institute of Technology (NAMTECH) in Gandhinagar, Gujarat, has been **operational since 2022**. NAMTECH currently running two schools with a combined capacity of **240 students**. It features **state-of-the-art laboratories** for smart manufacturing and industrial automation, designed in collaboration with industry leaders like **Festo, Schneider, Siemens, and LMW**. These labs provide hands-on learning experiences by **mimicking real-world factory environments**. NAMTECH caters to **Industry 4.0 workforce** demands and aims to bridge the gap between industry needs and skilled professionals.

The sponsoring body comprises of distinguished professionals with extensive experience in the education sector, playing a crucial role in establishing educational institutions.

S.no	Name	Brief Profile
1	Dr. Gauri Trivedi	Dr. Gauri Trivedi has had a distinguished career as an **IAS officer** and **educationist**. Over the past decade, she has been a member of the governing bodies of several educational institutions, including **NTPC School of Business**, **Charutar Arogya Mandal, Bhaikaka University**, and **Power Management Institute**. She serves as a guest faculty and consultant at prestigious institutes like **IIM, Sardar Patel Institute of Public Administration, CEPT Ahmedabad**, where she teaches governance, public policy, rural planning, and management. Additionally, she advises the Ramarang Seva Trust and its affiliates on educational and skill initiatives, as well as the establishment and operation of multiple educational institutions across **higher education**, school education, and vocational training.
2	Mr. Maulik Parindu Bhagat	Mr. Maulik Bhagat is the **Managing Director of Nascent Info** and holds directorships in over 10 companies, including Thousand Island Hotels and Resorts Pvt Ltd. He has significantly contributed to the establishment of several educational institutions in Gujarat, such as **Anant School of Excellence, Global Mission**

S.no	Name	Brief Profile
		International School, Anant National University, Drone Academy, and Sports Academy. Additionally, Mr. Bhagat is also a trustee of Ramarang Seva Trust and has been involved with its affiliate trusts for **over seven years**, focusing on **higher education** initiatives
3	Mr. Kedar Tambe	Mr. Kedar Tambe is the **Director at K.B. Mehta Construction**, where he demonstrates his dedication to managing the organization and commitment to excellence in construction. He holds a bachelor's degree in civil engineering, earned in 1982, which has provided him with the essential knowledge and skills for his field. Mr. Tambe began his career with rigorous training as a site engineer under the guidance of the company's founders. This experience equipped him with the expertise needed to achieve the company's objectives and contribute to the **development of new technologies in construction**. In addition to his extensive hands-on experience in construction management and execution, he also offers **project management consultancy services**. His multifaceted approach highlights his commitment to delivering high-quality results and contributing to the organization's success.
4	Mr. Kaneyuki Yamamoto	Mr. Kaneyuki Yamamoto began his career with Nippon Steel Corporation in April 1993. Over the years, he has held various managerial positions across multiple functions, including accounting, sales, and marketing relations. In 2013, he took on the responsibility of overseeing global exports, including to India. By 2019, he was appointed General Manager of the Marketing Department for Nippon Steel Corporation's Joint Venture in Thailand. Currently, he serves as the **Managing Director of Nippon Steel India Private Limited**. Additionally, he holds directorships in Jamshedpur Continuous Annealing & Processing Company Private Limited, ArcelorMittal Nippon Steel India Limited, AMNS Gandhidham Limited, and AM Mining India Private Limited.
5	Mr. Bradley Davey	Mr. Bradley Davey is a distinguished professional with over **25 years** of experience in technology and manufacturing. He currently serves as the **Executive Vice President and Head of Corporate Business Optimization at ArcelorMittal**. In this role, Mr. Davey oversees multiple critical functions, including serving as the Chief Technology Officer (CTO), overseeing **research and development** (R&D), managing capital goods, **corporate communications**, and **corporate responsibility**. His responsibilities also extend to the global **automotive sector**, including automotive joint ventures in China and India, and the oversight of ArcelorMittal Tailored Blanks

S.no	Name	Brief Profile
		Americas. Additionally, he is involved as Vice Chairman of the Investment Allocation Committee (IAC). Mr. Davey's journey with ArcelorMittal began in 1986 when he joined ArcelorMittal Dofasco, Canada. Over the next 15 years, he held several critical technology and manufacturing roles, laying the foundation for his distinguished career within the organization. His multifaceted leadership and pivotal role in shaping ArcelorMittal's **strategic direction** are a testament to his technical acumen and dedication to the industry.
6	Mr. Sanjay Sharma	Mr. Sanjay Sharma has been in the steel industry for over **20 years** and currently serves as **Vice President at ArcelorMittal**. He has held key leadership positions across multiple countries. As CEO of ArcelorMittal China and Vice President of Business Development for Southeast Asia and India, he played a crucial role in the company's **strategic growth** and in establishing ArcelorMittal's presence in India through the acquisition of Essar Steel, now known as AM/NS India. Mr. Sharma's journey with ArcelorMittal began in 2001, where he has since taken on various roles, including General Manager of **Mergers and Acquisitions**, CEO of VAMA, and COO at Hunan Valin Steel. Prior to ArcelorMittal, Mr. Sharma worked with McKinsey & Company and the Steel Authority of India Limited. In 2019, he was appointed to the board of **China Oriental**, one of the largest joint ventures in the Chinese steel industry. In addition to his professional roles, Mr. Sharma is recognized for his thought leadership and is a regular speaker at prominent forums on behalf of ArcelorMittal, such as the **World Economic Forum**

Need for a new age HEI in India

In alignment with India's goal of becoming a **$5 trillion** economy by 2030, the establishment of a new-age Higher Education Institution (HEI) is crucial to address the **workforce demands** of the manufacturing sector. Such an institution should combine **technical and managerial expertise** with **innovative teaching practices** and **sustainability** principles. However, India's current higher education infrastructure faces significant gaps in meeting this demand, as a result the skill deficiencies and outdated methodologies hinder both individual and national progress.

This new age HEI should serve as a transformative platform, bridging this gap by offering **industry-relevant curricula**, **project-based learning**, and **real-world problem-solving** opportunities. The emphasis should include a blended learning approach to accommodate diverse demographics and promote inclusive access. It must also prioritize fostering a culture of innovation, encouraging interdisciplinary research, and developing leaders who possess both technical and managerial acumen. With a sustainability-focused educational framework, the new age HEI should aim to contribute to India's **sustainable development goals** while preparing students for Industry 4.0 challenges.

Ultimately, this new age HEI will be instrumental in providing the **specialized manufacturing talent** that India needs to achieve its aspirations of becoming a global manufacturing leader. Through its comprehensive and forward-thinking approach, it will transform the educational landscape and significantly contribute to the nation's economic growth and global standing by becoming a **model institution** for other HEIs.

Vision and Mission of proposed Deemed-to-be University.

NAESF would establish the proposed Deemed-to-be University in line with **NEP 2020**'s vision as its core. The basic building block of the proposed new age Deemed-to-be University will be **competency-based curriculum** and **choice-based credit system** with an aim to provide high quality holistic education. The vision is:

> To be a new-age institution that **inspires humane capital** and creates a cadre of **conscious technologists**.

The proposed Deemed-to-be University will achieve its vision by ensuring **learner centricity** and bridging the competency gaps with strong emphasis on **immersive** and **experiential learning**. Elements like i**nternships** and project-based learning across the programs will outlay a strong industry emphasis. The proposed Deemed-to-be University will create **high impact**, long term socio-economic value and support nation's growth at a larger scale with the below mission:

> Impact **3 million** learners in next 10 years

Justification for distinctness

The proposed Deemed-to-be University seamlessly aligns to the criteria laid down by UGC for attaining the Deemed-to-be University 'distinct category' status in several ways as stated below:

- **Focus on addressing the strategic need of the country.**

The proposed Deemed-to-be University, established by NAESF aims to support India's strategic goals by developing an **industry-ready workforce** and driving indigenous innovation through **applied research**. It will align its academic programs with **national policies** to shape a **self-reliant**, **technologically advanced**, and **sustainable future** for India. The proposed Deemed-to-be University's commitment to **sustainability is integrated** into its curriculum and operations, supporting the **Lifestyle for Environment (LiFE)** initiative. Additionally, in line with India's vision of becoming a developed nation by 2047, the proposed Deemed-to-be University will contribute to the **Viksit Bharat @2047** initiative by focusing on **smart manufacturing**, **advanced robotics**, and s**ustainability** etc. domains, providing industry-relevant solutions and creating a skilled workforce.

The proposed Deemed-to-be University will embrace the **National Education Policy (NEP) 2020** by fostering multidisciplinary learning, creativity, and research. It will offer **flexible curricular structures**, **multiple entry and exit options** in postgraduate programs, and an **Academic Bank of Credits** (ABC) to store academic credits digitally. The proposed Deemed-to-be University aims to **improve learning outcomes** through personalized learning paths and research in education methodologies, shaping a new generation of thinkers and innovators ready to navigate global challenges.

- **Focus on Teaching and research in unique discipline(s)**

The proposed Deemed-to-be University aims to lead innovation in India's industrial future by offering programs crafted in **collaboration with industry**. The proposed Deemed-to-be University will offer programs in **Smart Manufacturing** Technology and Management, **Smart Automotive Systems** Technology and Management, **Semiconductor Manufacturing** Technology and Management, **Robotics** Engineering and Management, and **Sustainability** Engineering and Management. Each program will accommodate **600 students**, a scale unmatched by other higher education institutions. The curriculum integrates **Technology**, **Design**, **Management**, and **Sustainability**, preparing students for **conscious techno-managerial roles**. Students will engage in Industry Internships and Capstone Projects for practical experience. The proposed Deemed-to-be University's unique pedagogy includes **anchor academic** and **industry partners**, **flipped classrooms**, **industry-grade labs** that will mimic real world factories, and **interactive learning spaces**.

- **Engagement in preservation of the environment.**

The proposed Deemed-to-be University is dedicated to **integrating sustainability** into its academic and operational framework to address environmental challenges and promote sustainable development. This commitment is reflected in four key areas. Firstly, the proposed Deemed-to-be University will **embed sustainability principles across all academic programs**, incorporating modules on sustainable behaviour, energy transitions, and circularity. Secondly, to enhance experiential learning a "**Living**

Laboratory" will be established on campus. This dynamic environment will serve as a test bed for innovative sustainability practices and technologies. Third, the proposed Deemed-to-be University is also committed to **conducting applied research** that yields practical solutions to industry challenges. Faculty and students will engage in collaborative research initiatives focused on developing sustainable solutions, addressing societal and environmental needs. Lastly, the proposed Deemed-to-be University will actively **disseminate its expertise and resources through outreach programs**. It will organize workshops, seminars, and collaborative projects to promote sustainable practices and environmental preservation. By building partnerships with other educational institutions and MSMEs, the aim is to amplify its impact and foster a collective commitment to sustainability.

Through these efforts, the proposed Deemed-to-be University aims to cultivate a generation of **conscious technologists**, **addressing local and national environmental challenges** and contributing to the **global pursuit of a sustainable future**.

Plan for academics

The academic structure of the proposed Deemed-to-be University is systematically organized into a diverse array of **schools and centers**. The schools encompass a broad spectrum of unique disciplines, to ensure a holistic, robust, and interdisciplinary educational experience. The schools are complemented by **research and innovation cell**, which will be at the forefront of applied research and collaborative initiatives. Additionally, there will a center for **Meta Skills**.

S.no	School / Center	Brief Description
1	**School of Manufacturing Technologies**	Aims to develop experts in **Smart Manufacturing and Smart Automotive Systems**. With industries increasingly using digital solutions to boost efficiency and quality, the school will offer comprehensive knowledge in **advanced manufacturing technologies and management**. Courses will include topics like Industrial IoT, data analytics, automation, and project management, preparing students for high-tech manufacturing environments
2	**School of Manufacturing Design and AI**	Aims to integrate traditional **manufacturing design** with the latest **advancements in artificial intelligence**. It will offer a program in Semiconductor Manufacturing Technology and Management, focusing on secure, data-driven, and innovative design. Courses will highlight precision and miniaturization technologies essential for electronics and digital devices.
3	**School of Sustainability**	Aims to focus on **environmental conservation**, **resource management**, and **sustainable practices**. The curriculum will

S.no	School / Center	Brief Description
		emphasize practical approaches to **reducing environmental impact**, including minimizing carbon emissions, and adopting eco-friendly manufacturing processes. Students will also learn about environmental policy, regulatory standards, and the role of technology in achieving **sustainability goals**.
4	**School of Robotics**	Aims to offer interdisciplinary programs focusing on the **design, construction**, and **operation of robots**. The curriculum will prepare students to develop and manage robotic systems for various sectors like manufacturing and logistics. Indicative courses will include robotic kinematics, dynamics, control systems, human-robot interaction, and AI in robotics. Students will also receive hands-on training with **robotic equipment** to master **integration**, **troubleshooting**, and **maintenance**.
5	**Research and Innovation Cell**	The research and innovation cell will serve as a hub for pioneering **research and development**, with an emphasis on creating **industry-ready solutions** and fostering academic excellence. By promoting **interdisciplinary projects** across fields like AI, robotics, and sustainability, it will encourage students and faculty to engage in **impactful research** that addresses real-world challenges. The Research and Innovation Cell will aim to build **partnerships with industries** and other **academic institutions**, facilitating knowledge exchange and collaboration.
6	**Center for Community Outreach**	This center aims to empower communities through **skill-based technical education**. It will include Centers for Advanced Technical and Vocational Education and Training (**TVET**) and **Industrial Training Institutes (ITIs) Outreach**. These centers will offer advanced training programs for certified **technicians and diploma holders**, enhancing their **employability and technical skills**. The curriculum will cover industrial maintenance, safety standards, digital literacy, and hands-on skills for various trades. ITI Outreach will support Industrial Training Institutes (ITIs) to bridge skill gaps in vocational education, ensuring equitable access to quality training.
7	**Center for Meta Skills**	This center will focus on the development of essential skills such as **critical thinking, problem-solving, teamwork, and communication**. The Center for Meta Skills will offer modules for program offerings, workshops, seminars, and practical training sessions aimed at fostering these transferrable skills, which are crucial in a rapidly changing work environment.

The proposed Deemed-to-be University's innovative two-year master's program is designed to meet the evolving needs of students, industry, and academia. Additionally, it is aligned with NEP 2020, featuring multiple academic pathways with flexible exit point. It includes a common first year and three specialized pathways in the second year, ensuring graduates are well-prepared for their careers.

Year 1: Foundation Through Coursework

The first year will be **residential** and serve as the cornerstone of the program. Students will immerse themselves in **intensive classroom** and **laboratory-based learning**, focusing on advanced concepts and **practical applications** in their chosen domain. The residential format ensures a conducive environment for **collaborative learning**, **hands-on experiences**, and access to **cutting-edge infrastructure**.

Year 2: Tailored Pathways for Specialized Learning

The second year adopts a **flexible, pathway-based approach**, enabling students to **tailor their learning experience** based on their career aspirations. The year is structured into two semesters with each semester carrying **20 credits**, culminating in a total of 40 credits for the year. Students can choose from the following three pathways:

Pathway 1: Industry Engagement and Capstone Project

This pathway is designed for students aiming to **gain in-depth industry exposure** and hands-on problem-solving experience. Key features include:

- Identification of an industry-specific **problem statement** in collaboration with corporate partners.
- Development of a comprehensive plan, including **hypothesis formulation**, methodology design, and evaluation framework.
- Practical **implementation of the plan** within the industry, supported by mentors from both the university and industry.
- **Evaluation** based on project outcomes and contributions to the organization.

Pathway 2: International Mobility

This pathway is ideal for students seeking **global exposure and academic enrichment** through international study opportunities. Key features include:

- **Collaboration** with leading institutions abroad.
- **Transfer of credits** through the Academic Bank of Credits (ABC), in accordance with UGC guidelines.
- **Immersion in diverse academic and cultural environments**, enabling students to develop a global perspective and network.

Pathway 3: Research Excellence

Designed for students with a **passion for research** and academia, this pathway allows for a focused exploration of a specific topic. Key features include:

- Selection of a research area and development of a **detailed synopsis**, covering aspects such as the problem statement, hypothesis, literature review, rationale, objectives, methodology, and analysis framework.
- **Rigorous evaluation** and approval of the synopsis by a research advisory panel.
- Completion of a **detailed thesis** under the guidance of faculty mentors, contributing to the body of knowledge in the field.

Award and Exit Options

- Upon successful completion of the two-year program, students will be awarded a **Masters degree** in their respective field.
- For students opting to exit the program after the first year, a **Postgraduate Diploma** will be conferred. This exit option is in line with the principles of the National Education Policy (NEP) 2020, ensuring flexibility and recognition for completed learning milestones.

Program Parameters:

- **Target Audience:** Students in their final year of B.E./B.Tech. or those who have completed their degree within the last five years.
- **Duration:** **2 years**
- **Mode of Delivery:** **Residential**
- **Learning Outcomes:** Graduates will be equipped with **domain, functional**, and **behavioral skills**, preparing them for professional roles or further research.
- **Employment Opportunities:** Graduates can pursue **mid-to-senior roles** such as Data Scientist, Automation Engineer, or Sustainability Analyst in industries like **semiconductors, robotics, and environmental technology**. The program provides comprehensive training in emerging technologies, preparing students for specialized positions.

The proposed Deemed-to-be University proposes the following programs:

School/ Center	Specializations for Masters program in
School of Manufacturing Technologies	• Smart Manufacturing Technology and Management • Automotive Systems Technology and Management

School/ Center	Specializations for Masters program in
School of Manufacturing Desing and AI	• Semiconductor Manufacturing Technology and Management
School of Sustainability	• Sustainable Engineering and Management
School of Robotics	• Robotics Engineering and Management

The proposed Deemed-to-be University aims to foster an environment that encourages critical thinking, creativity, and lifelong learning. The **curriculum**, meticulously crafted with **industry and global academic partners**, integrates contemporary educational theories with practical applications. This ensures that students are not only well-versed in their chosen fields but also equipped with the skills necessary to navigate and excel in a dynamic global economy. By embracing a **student-centered approach** and leveraging cutting-edge technology, the proposed Deemed-to-be University seeks to create a **transformative educational experience** that prepares graduates to be **leaders and innovators** in their respective domains.

The **flipped classroom** method will emphasize on pre-class preparation, transforming classroom sessions into interactive spaces for analysis, discussion, and hands-on learning, thereby enhancing **student engagement and comprehension**. While the **State-of-the-art laboratories** equipped with advanced technologies that **mirror industry standards** will provide students with practical experience in **realistic environments**, preparing them for seamless transitions into the professional world. Additionally, **capstone projects** with industry partners will integrate theoretical knowledge with practical applications, solving real-world problems and fostering collaboration, innovation, and problem-solving skills. The proposed Deemed-to-be University aims to instill a **maker mindset** in students, encouraging them to **explore, experiment**, and **build solutions** through practical work, reinforcing their technical, functional, and behavioral skills.

Industry-centered learning is achieved through close partnerships with leading industry players, bringing experts into the classroom for workshops, internships, and projects. **Experiential learning** is a core component of the educational experience, engaging students in real-world simulations, case studies, capstone projects, internships, and workshops. This approach ensures that students can directly apply classroom concepts, grounding their learning in real-world applications and enhancing their competence and practical knowledge.

Additionally, the proposed **evaluation framework** for the Deemed-to-be University aims to maintain academic rigor and promote **continuous learning**. It will adhere to the University Grants Commission (UGC) guidelines under the **Choice-Based Credit System** (CBCS). This approach ensures a robust and flexible assessment system that aligns with the competencies and learning outcomes outlined in the National Education Policy (NEP) 2020 and Bloom's Taxonomy.

Plan for infrastructure

The proposed Deemed-to-be University is envisioned as a state-of-the-art campus fostering excellence, sustainability, and experiential learning. Spread across approximately **150 acres,** the proposed Deemed-to-be University is planned to be **developed in phases over 15 years**. This phased development approach allows the institution to accommodate the evolving needs of its students and faculty while maintaining its commitment to excellence.

The **first phase, spanning 3-5 years**, will utilize **30 acres** of land with a target **construction area of 1 million square feet**. This phase will include technology-enabled classrooms, high-tech laboratories, workshops, computer labs, an auditorium, and residential facilities. Designed to **accommodate 2,425 students** on 31.5 acres, it focuses on creating a holistic and enriching learning experience. Subsequent phases will focus on expanding the infrastructure. The **second phase** will support an **additional 3,600 students** through the development of academic buildings, residential complexes, and recreational areas. The **third phase** will further increase capacity to accommodate an **additional 4,200 students**, with advanced academic facilities, sports complexes, and utilities ensuring a high-quality educational experience as the institution grows.

The proposed Deemed-to-be University's campus has been conceptualized as a "**living-learning**" ecosystem that optimizes land use while integrating creative, sustainable, and meaningful architectural designs. The design emphasizes **sustainability, well-being, and community** by including open spaces, walking corridors, and social centers that promote a sense of belonging. Iconic features such as the "Innovation Gateway," inspired by local cultural elements like **Ahmedabad's "Darwazas**" and kite festivals, will serve as architectural landmarks. This gateway, a blend of technology and artistry, includes a **14-meter-high immersive experience room** at the Welcome Centre, symbolizing the future of education and innovation.

To ensure excellence in planning and execution, the proposed Deemed-to-be University has engaged CRDF (**CEPT Research and Development Foundation**) at **CEPT University** to oversee a two-stage design competition. The competition focused on the master plan, infrastructure design, landscape design, and architectural plans for phase-1 buildings. **Design proposals** were evaluated on vision alignment, aesthetics, innovation, smart technology integration, and sustainability. This process guarantees a contextual and forward-thinking campus design that aligns with the proposed Deemed-to-be University's vision.

The proposed campus will be divided into **academic and non-academic zones**. The academic area will include **instructional and administrative spaces** with advanced laboratories and classrooms, while the non-academic area will house residential facilities, a sports complex, recreational spaces, and utilities. A detailed list of indicative spaces to be built in the first phase is given below:

S.no	Base Data	Value (in Numbers)
1	Plot Area (acres) – Land	149.8
2	Phase 1 Land Area (acres)	31.5
2	Student Capacity (Academic)	2,425
3	Total number of Schools	4
4	Typical Cohort Size	30
4	Total Nos. of Cohort (Divisions)	82
5	Total Nos. of Courses	15
6	Nos. of Cohort (Divisions) per course	5
	Female Learners (35%)	849
	Male learners (65%)	1,576
7	Total Hostel Capacity	2,425
	No. of Female Hostels (300 capacity each)	3
	No. of Male Hostels (300 capacity each)	5
8	Total number of Faculty (1:15)	162
9	Total number of Staff (1.1 times Faculty)	178
10	Number of Faculty/ Staff Housing Units (for 90%)	306
	2 BHK	229
	3 BHK	76

The built-up area for the phase-1 development is given in the below table:

#	Space	Per Unit BUA in (Sq. Mts)
A	Instructional Area (INA)	14,184.0
B	Admin / Office Area (ADA)	6,000.0
C	Amenities Area (AMA)	4,000.0
	Sub Total (INA + ADA+ AMA)	24,184.0
D	Access and Circulation Area (ACA)	6,046.0

#	Space	Per Unit BUA in (Sq. Mts)
	Total INA+ADA+AMA+ACA	30,230.0
E	Recreational Area + Others	2,435.0
F	Accommodation Area	59,800.5
	Total	**92,465.5**

Furthermore, the proposed Deemed-to-be will encompass thoughtfully designed **recreational facilities and common areas** to foster a vibrant and holistic campus experience. With a total **built-up area of 4,326.5 Sq. Mts** dedicated to these facilities, this space will provide students with diverse opportunities for recreation, wellness, and social engagement. The areas will include Auditorium, Sports facilities, Student wellness center, Content studio, Laboratories, Library, Seminar and meeting halls, Café and canteen, and Open spaces.

The **ICT infrastructure** will be built around a **digital-first philosophy** and ensuring that immersive learning elements such as AR**/VR labs, cyber-physical systems, virtual simulation rooms, and smart classrooms** are seamlessly integrated into the academic environment. This infrastructure will enable continuous learning across classrooms, labs, industry settings, and beyond, ensuring access to quality education from any location.

Key technologies like cloud-based **Learning Management Systems** (LMS), **Student Information Systems** (SIS), and **Enterprise Resource Planning** (ERP) systems will support both academic and administrative operations, ensuring robust internal and external reporting, dashboarding, and monitoring. **Campus security** will be enhanced through AI-enabled CCTV cameras with cloud storage, and access control will be managed via facial recognition systems in labs, classrooms, and restricted areas. Additionally, a **comprehensive campus-wide Wi-Fi network** will support IoT devices in labs, facilitating real-time data monitoring and control.

Summary of 15-year strategic vision

The proposed Deemed-to-be University will focus on developing **humane capital** and creating **conscious technologists** to close existing skills gaps in manufacturing domain. It aims to prepare an Industry 4.0-ready workforce through interdisciplinary projects and digital tools, ensuring excellence and accessibility in higher education.

0-5 Years	5-10 Years	10-15 Years
Academics		

0-5 Years	5-10 Years	10-15 Years
• Launch four new schools: Manufacturing, Design and AI, Robotics, and Sustainability. • Launch of 5 flagship Master programs in domains of smart manufacturing, smart automotive systems, semiconductor manufacturing, robotics, and sustainability • Launch of 5 additional flagship master programs for which the curriculum is work in progress in collaboration with industry and academic partners (indicative specializations - Cybersecurity, Health Informatics, Prompt Engineering etc.)	• Expand specialisation portfolio. • Scale existing programs. • Introduction of research fellowships and PhD degree	• Due to rapidly evolving technologies, during the 11–15-year time, the proposed Deemed-to-be University will focus on strengthening, consolidating, and updating the existing courses to ensure the market relevance of the programs. • Newer flagship programs will be launch based on the prevailing market requirement and technological advancements in physical sciences and allied sectors.
Applied Research		
• Set up the core research infrastructure (labs and centers). • Develop state-of-the art research park with facility to accommodate 50 companies. • Develop strategic partnerships with industries, government bodies, and academic institutions. • Identify and refine key research themes within focus areas. • Closely work with industry to solve industry problems using state-of-the art lab infrastructure.	• Closely work with industry to solve industry problems using state-of-the art lab infrastructure. • Inception of PhD and fellowship programs • Broaden industry collaborations to include international partners. • Launch interdisciplinary research projects across multiple focus themes. • Scale up funding opportunities through national and international grants.	• Establish the proposed Deemed-to-be University as a global leader in engineering and technology research. • Achieve major breakthroughs in key focus areas such as AI-driven manufacturing, sustainable energy solutions, and advanced robotics. • Strengthen the proposed Deemed-to-be University's role as a thought leader in India's research ecosystem. • Foster commercialization of research outcomes through patents, startups, and industry collaborations. • Consolidate global partnerships, positioning

0-5 Years	5-10 Years	10-15 Years
		the university as a key player in international research networks.
Students Admission		
• Define and finalize the eligibility and scholarship criteria for student enrollment according to guidelines. • Design and launch digital and offline marketing campaigns targeting the relevant demographics. • Conduct webinars, open houses, and campus tours to showcase the state-of-the-art infrastructure. • Develop program brochures, videos, and other collaterals for 5 flagship programs. • Set up of website with details of all 5 schools and their flagship programs, fees, governance structure etc.	• Enhance branding for diverse student recruitment across India. • Align the digital and offline marketing campaigns with the market and industry trends to attract right talent. • Conduct online webinars, open houses, and campus tours to showcase the state-of-the-art infrastructure. • Automate the process to develop program brochures, videos, and other collaterals	• Formulate a strategy to attract international students. • Launch marketing campaigns to attract international students. • Visit international academic institutions to conduct webinars and open houses.
Faculty Recruitment		
• Develop a recruitment process to attract top-quality faculty. • Institutionalize a fast-track recruitment process with clear criteria and an efficient application and interview process. • Proactively encourage faculty with international academic experience and	• Maintain a mix of faculty from diverse backgrounds. • Accelerate the composition of visiting faculty. • Exposure to international training and conferences for faculty	• Increase outreach efforts to attract candidates from underrepresented groups. • Recognize and support long term faculty through professorships, awards, and other incentives. • Facilitate staff exchanges and other professional development opportunities.

0-5 Years	5-10 Years	10-15 Years
research credentials to apply. • Develop a vibrant ecosystem of housing, facilities, and environment for faculty. • Organize regular training sessions for faculty on innovative teaching methodologies in collaboration with partners. • Appoint the faculty as mentor for a group of 4-5 students to guide them during their 2-year program	• Develop new and diversified training programs to attract top-quality faculty	• Maintain a cutting-edge ecosystem of housing, facilities, and environment
Infrastructure		
• Development on around 30 acres land, with approximately 1 million square feet of construction. This initial phase will feature state-of-the-art technology-enabled classrooms, workshops, high-tech laboratories, library, computer labs, auditorium, residential facilities, other essential amenities. • Integrate elements of sustainability in the infrastructure	• expand its infrastructure to accommodate additional student capacity. • focus on building facilities to support 3,600 students. It will focus on adding additional state-of-the-art technology-enabled classrooms, workshops, high-tech laboratories, computer labs. • It will also increase capacity of residential and recreational facilities to accommodate 3,600 students. • Integrate and upgrade elements of sustainability in the infrastructure	• The third phase will further increase capacity for an additional 4,200 students. • This will include construction of new academic buildings, residential facilities, recreational areas. • Upgrade and maintain elements of sustainability in the infrastructure
ICT Infrastructure		

0-5 Years	5-10 Years	10-15 Years
• installing and upgrading of basic networking, connectivity, and storage infrastructure. • Implementation of a robust learning management system (LMS), ERP modules and cloud computing infrastructure • Installation of digital signages and interactive dashboards • Development of virtual lab infrastructure through installation of AR/VR and virtual simulation devices & software • Develop and rollout of a mobile application (one-stop solution for all major stakeholders) • Extensive implementation of AI/ML technology • Initiation of a robust mobile device management program • Automate routine processes	• Implement a smart campus technology system. • Design and implement advanced cybersecurity protocol and infrastructure. • Integration of IoT devices and sensors across campus infrastructure • Explore various usages of blockchain and implement the technology. • Use of digital twin and predictive maintenance technology	• Develop a plan and integrate quantum computing. • Design and integrate robotics and automation across all campus infrastructure. • Extensive use of IIoT devices and sensors
Student Experience		
• Establish a streamlined, digital-first platform for handling applications, registrations, and enrollments. • Set up systems for flexible course module selection. • Launch accommodation services with a focus on comfort, safety, and community	• Upgrade the application, registration, and enrollment platforms with AI-driven tools. • Expand and modernize accommodation facilities. • Scale wellness services, adding more comprehensive mental	• Continuously monitor and refine the digital platforms. • Maintain the wellness and career services at peak performance,

0-5 Years	5-10 Years	10-15 Years
• Implement health and wellness programs. • Establish avenues for student engagement through clubs, extracurricular activities, and campus events. • Develop a career services office	health programs and wellness workshops. • Expand the capabilities of the online services platform, integrating it with more advanced tools	
Placements		
• Establish a fully functional Placement Cell with cutting-edge facilities, including online placement portals and skill-assessment labs. • Form a dedicated team of placement officers, corporate relations managers, and trainers. • Organize industry talks, webinars, and guest lectures. • Develop placement collaterals and a dedicated online portal for placement process	• Establish regional corporate liaison offices in major cities (Bengaluru, Pune, Hyderabad, and Delhi) to strengthen ties with industries. • Deploy AI-enabled tools for tracking industry trends, automating recruitment processes, and personalizing student preparation. • Establish an active alumni association to mentor students and provide strategic insights on industry trends.	• Transform the Placement Cell into a dedicated Career Development Center offering lifelong career support to alumni. • Host international placement drives and job fairs. • Ensure the proposed Deemed-to-be University is ranked among the top 5 institutions for placements in India and the top 50 globally.

Summary of 5-year rolling implementation plan

Year 1: Foundation and launch of flagship programs
Objective: *Launch of 5 flagship programs across 5 schools*
The first year focuses on establishing the foundational structures for the proposed deemed-to-be university. Key **governance bodies**, such as the Executive Council, Academic Council, and various advisory boards, are constituted. **Comprehensive policies** governing admissions, recruitment, diversity, wellness, and safety are developed. **Faculty and staff** are **recruited** in

line with UGC norms to ensure smooth functioning of the institution, while **physical and digital infrastructure**, including state-of-the-art labs, is made **operational.**

Academically, **curricula are finalized**, and the flipped classroom model is adopted for the flagship programs across four schools. The university secures **AICTE approval** and launches **outreach campaigns** to attract students. Admissions are conducted through **entrance exams**, and **orientation programs** are organized to integrate students into the academic environment. Simultaneously, a **placement cell** is established, and partnerships with industry and academia are leveraged for capstone projects and internships. Initial efforts to position the university as a leader in innovation and education are undertaken through **campaigns and high-profile events**

Year 2: Expansion of specialisation in program and strengthening operations

Objective: *Launch 2 additional flagship programs and scale operations*

In the second year, the focus shifts to the launch of **two additional flagship programs** and scaling existing operations. The Deemed-to-be University collaborates with anchor industry and academic partners to **develop curricula and set up labs** aligned with new programs. **Recruitment of additional faculty** ensures compliance with an expanding faculty-student ratio, while support staff are hired to manage increased administrative workloads.

Infrastructure is further expanded to accommodate new students and programs. For Year 2 students, **pathways such as research, industry, and international mobility** are introduced, with guidance provided to help students align their academic journey with career aspirations. The institution continues to **build its reputation** by engaging with stakeholders, refining operational processes, and initiating preparations for accreditation.

Year 3: Strengthening core programs

Objective: *Enhance the 7 existing flagship programs*

The third year focuses on **solidifying the existing seven flagship programs**. Curricula and assessments are **reviewed and updated** based on feedback from students, faculty, and industry partners. Infrastructure expansion continues as per the Deemed-to-be University's long-term growth plan, **ensuring adequate resources** for both students and faculty.

A significant milestone in Year 3 is the establishment of an **Alumni Relations Office**, which lays the groundwork for fostering a strong alumni network. The Deemed-to-be University supports Year 2 students pursuing the research pathway by providing access to state-of-the-art labs and faculty mentorship. Placement efforts continue for graduating cohorts, with detailed **placement reports** being prepared to meet accreditation requirements. Institutional positioning is strengthened further through **targeted engagement with ranking and accreditation agencies**

Year 4: Introduction of new specializations and scaling up of operations

Objective: *Introduce 3 new flagship programs and continue scaling*

Year 4 marks the **launch of three additional flagship programs**, bringing the total to 10. The proposed Deemed-to-be University develops curricula for the new programs while continuing to **refine and update existing ones**. **Faculty recruitment is intensified** to meet the growing academic requirements, and **infrastructure is scaled up** to handle increased enrollments.

Outreach efforts are enhanced with updated marketing materials and campaigns tailored to new demographics. **NAAC accreditation becomes a key focus**, with preparatory data collection and documentation being prioritized. The proposed Deemed-to-be University also **leverages alumni networks** to boost its reputation and enhance student support. Placement and student support systems are further strengthened to maintain high standards for **student satisfaction and career outcomes**.

Year 5: Full scaling of operations

Objective: *Strengthen all flagship programs and secure NAAC accreditation*

The fifth-year centers on consolidating the institution's achievements and achieving **NAAC accreditation.** With a **fully operational academic portfolio** of 10 flagship programs, the proposed Deemed-to-be University **reviews and scales its systems** and processes to ensure sustainability and growth. Infrastructure is further expanded to accommodate long-term capacity needs, and the institution continues to **refine its curricula** based on the evolving demands of industry and academia.

Efforts toward **alumni engagement intensify,** with regional chapters and networking events fostering a sense of community. NAAC application is completed and submitted, with the institution preparing for inspections and reviews. Placement activities remain a priority, with continued engagement with top recruiters to ensure strong career outcomes for graduating students. By the end of Year 5, the proposed Deemed-to-be University aims to **solidify its reputation as a premier institution**.

1. About ArcelorMittal Nippon Steel India

This section provides a comprehensive profile of the founding partner of the proposed Deemed-to-be University.

ArcelorMittal is the world's 2nd largest[1] integrated steel and mining company. They are the largest steel producer in Europe and among the largest in America with a growing presence in Asia. ArcelorMittal produced approximately 60 Mn Tonnes[2] of crude steel in 2023, with its steel manufacturing facilities spanning across 16 countries and customers across 140 countries. They recorded a revenue of $ 68.3 Bn[3] in the year 2023. As of 31st December 2023, the company had a total employee strength of 1,26,756[4]. The company is committed to building solutions for sustainable development of the world which is also evident by their investments in smart carbon technologies, green hydrogen processes, set up of decarbonization units and clean electricity. ArcelorMittal aims to achieve net-zero emissions by 2050[5] and develop technologies capable of taking the manufacturing industry towards net-zero.

Nippon Steel Corporation Japan's largest producer of steel has the world's 4th largest[6] integrated steel manufacturing and mining operations. They produced approximately 45 Mn Tonnes[7] of crude steel in the year 2022 and recorded a revenue of $ 55.9 Bn[8] in the year 2023. The company has manufacturing facilities spanning across more than 15 countries. As of 31st December 2023, the company had a total employee strength of 28,331[9]. The company is with conviction dedicated to the creation of solutions tied to sustainable progression of the global community as they work towards their mission to achieve carbon neutrality by 2050. [10] Their sustainability plan revolves around provision of high-performance steel products and solutions to reduce CO2 emissions, and of carbon neutral steel production through decarbonization of the steelmaking process.

ArcelorMittal and Nippon Steel together churn approximately 6 per cent [113.26 Mt] of the total global steel production (2022). In 2019, with one of the largest FDI influx [~ 7.2 billion USD], ArcelorMittal and Nippon steel entered the Indian steel market as a joint venture. ArcelorMittal Nippon Steel India (AM/NS India) is an Indian joint venture of ArcelorMittal

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[1] The world's top 10 steelmakers | Reuters
[2] arcelormittal-factbook-2023-web_interactive_april-30th.pdf
[3] arcelormittal-factbook-2023-web_interactive_april-30th.pdf
[4] FAQ | ArcelorMittal
[5] MT- 31.12.2023 - 20-F Document (arcelormittal.com)
[6] The world's top 10 steelmakers | Reuters
[7] World Steel Figures 2023
[8] Nippon Steel Financial Report 2022
[9] Additional Facts (nipponsteel.com)
[10] 日本製鉄株式会社　サステナビリティレポート2023　英語版 (nipponsteel.com)

S.A. and Nippon Steel Corporation. AM/NS India was established in December 2019, post the acquisition of Essar Steel in India an integrated flat steel manufacturer.

As part of its expansion program, AM/NS India is contributing to the strengthening of India's steelmaking expertise and capabilities, including the development of downstream facilities to produce value-added steels to reduce India's reliance on steel imports for use in sectors such as defense, automotive and infrastructure. The company has a long-term ambition to raise its national capacity to 30 MTPA in the coming decade, supporting the government's National Steel Policy that envisages doubling domestic capacity to 300 MTPA by 2030[11].

Actively supporting the nation, AM/NS India collaborates with the National Small Industries Corporation (NSIC) and the National Skill Development Corporation (NSDC) to enhance youth employability. Additionally, AM/NS India contributes to renewable energy initiatives through their partnerships and aligns themselves with India's vision to achieve carbon neutrality by 2070.[12]

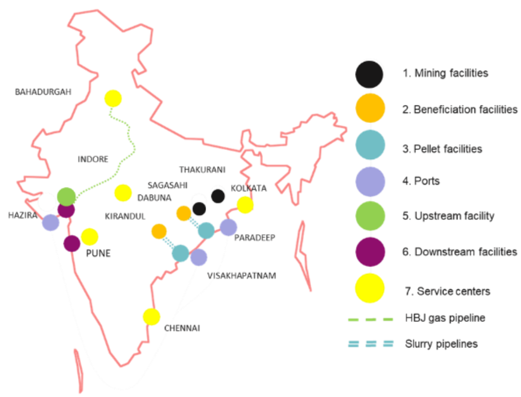

Figure 1 : Presence of AM/NS India across India

Further, AM/NS India has invested more than INR 160,000 Cr for steel manufacturing facilities in the state of Gujarat and Odisha and aspires to contribute to the communities in which it operates through its social initiatives. AM/NS India is building the world's largest single integrated steel plant in Gujarat and in Odisha with each a capacity of producing 24 million metric Tonnes of crude steel per annum. These projects are expected to create a total direct employment for more than 25,000 people.

As an aim to contribute to the development of the nation towards being a manufacturing superpower AM/NS India focuses on developing essential human capital and future-proof skills, through immersing students in experiential campus life founded on their own timeless, yet global values of sustainability, solidarity, and wellbeing.

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[11] Press Releases (amns.in)

[12] saBKbC7BALESvGD0WO8L.pdf (amns.in)

2. About sponsoring body for the proposed Deemed-to-be University: New Age Education and Skills Foundation (NAESF)

This section provides a comprehensive overview of the sponsoring body of the proposed Deemed-to-be University and profiles of its members.

AM/NS India and Ramarang Seva Trust share common belief that society is an important stakeholder, and that one should be involved in community engagement programs and social initiatives for the holistic upliftment of society. They believe that establishment of an academic institution will catalyze socio-economic upliftment of the country meanwhile contributing to an *Atmanirbhar Bharat*. AM/NS India and Ramarang Seva Trust have together founded **New Age Education and Skills Foundation** (NAESF), a non-profit organization that has been incorporated as a Section-8 company under the Companies Act, 2013 on 17 January 2023. NAESF will act as the 'sponsoring body' of the proposed Deemed-to-be University. NAESF has been established with the objective of establishing, promoting, operating, and supporting Institute(s), colleges, schools, and any other institution to encourage education, research, vocational training and skill development in all branches or fields of research and education for development of India.

NAESF intends to establish the proposed Deemed-to-be University as an iconic institution that is expected to transform the higher education space and create an enormous social impact. It is the intention of NAESF that the proposed Deemed-to-be University will be a new-age, world-class institution of global excellence offering scalable, experiential, advanced learning and applied research programs that would enhance the employability and training ecosystem through innovative outreach programs and contribute to the overall nation-building. The proposed Deemed-to-be University is expected to transform the higher education space and create an enormous social impact in Industry 4.0 and aligned sectors.

The proposed Deemed-to-be University will be established under the Deemed-to-be University Regulation 'Distinct Category' 2023, primarily dedicated for addressing the strategic needs of the country, teaching unique disciplines, and engage in the preservation of the environment. The proposed Deemed-to-be University will be in Gujarat with a potential for lasting impact at scale on the communities.

2.1 Experience in Promoting and Running Education Institute

New Age Education and Skills Foundation (NAESF) launched an initiative in higher education called New Age Makers' Institute of Technology (NAMTECH) in Gandhinagar, Gujarat. NAMTECH aims to foster an Industry 4.0 workforce tailored for the manufacturing sector in India. By investing in education, training programs, and initiatives that empower individuals to acquire and hone advanced skills, NAMTECH aims to bridge the gap between the demand for industry 4.0 ready professionals and the available talent pool. NAMTECH commenced operations in August 2022 from its transitory campus at IIT

Gandhinagar Research Park and currently has two schools operational with a combined capacity of 240 students. NAMTECH also has established state-of-the-art laboratories that are meticulously designed for smart manufacturing and industrial automation. These labs mimic the factory environment in real world, enhancing the experience of hands-on learning. Eight of the labs are functional and equipped with cutting-edge, tools and precision equipment technologies from leading industry partners such as Festo, Schneider, Siemens, LMW etc.

2.2 Members of the Sponsoring Body (NAESF)

The members of the sponsoring body are distinguished professionals with experience in the education sector. They play a pivotal role in the establishment of educational institutions, utilizing their diverse expertise to ensure the successful creation of the proposed Deemed-to-be University.

Dr Gauri Trivedi

Dr Trivedi, Gauri, served in high-ranking position as an IAS officer and an eminent educationist, and her education related experience over a period of 10 (ten) years includes membership of the governing body of education institutions such as **NTPC School of Business, Charutar Arogya Mandal, Bhaikaka University and Power Management Institute**. She is also guest faculty and consultant in several reputed institutes such as **IIM, Sardar Patel Institute of Public Administration and CEPT Ahmedabad** teaching governance, public policy, rural planning, and management. She is working as a **guest faculty teaching civil services aspirants, young students from eminent institutions and NGOs**. Additionally, she has been actively advising affiliate / group trusts of Ramarang Seva Trust in impact led educational, skill initiatives and establishment and operations of multiple educational institutions in higher education, school education and vocational space.

Dr Gauri Trivedi has a M.A. (Political Science) from JNU, Delhi, M. Phil (Soviet Studies), JNU, Delhi, Doctorate in Philosophy from Institute of Social & Economic Change, Bengaluru and Institute of Development Studies, Mysore and PGPPM from Indian Institute of Management (IIM), Bangalore.

Mr. Maulik Parindu Bhagat

Mr. Bhagat, Maulik is the MD of Nascent Info. He is a partner and director in more than 10 companies including Director Thousand Island Hotels and Resorts Pvt Ltd.

He has played a pivotal role in establishing numerous educational institutions in Gujarat – **Anant School of Excellence, Global Mission International School, Anant national University, Drone Academy and**

Sports Academy. Mr. Maulik Bhagat is a trustee of Ramarang Seva Trust and has been associated for over 7 (seven) years with its affiliate / group trusts engaged in the running of a HEI. Mr. Bhagat is an engineering graduate from Dhirubhai Ambani Institute of Information and Communication Technology (DA-IICT).

Mr. Kedar Tambe

Mr. Kedar Tambe, an accomplished professional, currently serves as a Director at K.B. Mehta Construction. His role at the company reflects his dedication to managing the organization and his commitment to excellence in the field of construction. Mr. Tambe's academic foundation is anchored in his bachelor's in civil engineering, which he earned in 1982. This educational background has equipped him with the essential knowledge and skills to excel in the field of civil engineering and construction. His journey within the organization began with rigorous training as a site engineer under the guidance of the founder members. This foundational experience equipped him with the skills and knowledge necessary to achieve the company's objectives and contribute to the development of new technologies in the construction industry. In addition to his hands-on experience in **construction management and execution**, Mr. Tambe also offers project management consultancy services. His multifaceted approach to project management and construction further underscores his commitment to delivering high-quality results and contributing to the success of the organization.

Mr. Kaneyuki Yamamoto

Mr. Yamamoto, Kaneyuki began his career with Nippon Steel Corporation in April 1993, where he held managerial positions across various functions, including accounting, sales, and marketing relations. In 2013, he took on the responsibility for overseeing global exports, including to India. By 2019, he was appointed as General Manager of the Marketing Department for Nippon Steel Corporation's Joint Venture in Thailand. Currently, he serves as the Managing Director of Nippon Steel India Private Limited. He also holds directorships in Jamshedpur Continuous Annealing & Processing Company Private Limited, ArcelorMittal Nippon Steel India Limited, AMNS Gandhidham Limited, and AM Mining India Private Limited.

Mr. Bradley Davey

Mr. Bradley Davey, a distinguished professional with over 25 years of experience in technology and manufacturing, currently serves as the Executive Vice President and Head of Corporate Business Optimization at ArcelorMittal. As the Head of Corporate Business Optimization, Mr. Davey shoulders multiple critical responsibilities.

These encompass the Chief Technology Officer (CTO), overseeing research and development (R&D), managing capital goods, corporate communications, and corporate responsibility. Furthermore, his purview now also extends to the global automotive sector. Mr. Davey's role also encompasses the responsibility of automotive joint ventures in China and India, the oversight of ArcelorMittal Tailored Blanks Americas, and his involvement as Vice Chairman of the Investment Allocation Committee (IAC). These responsibilities are a testament to his multifaceted leadership and pivotal role in shaping ArcelorMittal's strategic direction. His journey with ArcelorMittal commenced in 1986 when he joined ArcelorMittal Dofasco, Canada. Over the next 15 years, he held several critical technology and manufacturing roles, thus laying the foundation for his distinguished career within the organization. His contributions in these formative years underscore his technical acumen and dedication to the industry.

Mr. Sanjay Sharma

Mr. Sanjay Sharma has been in the steel industry for over 20 years, currently serving as Vice President at ArcelorMittal. He has held key leadership positions across multiple countries.

As CEO of ArcelorMittal China and Vice President of Business Development for Southeast Asia and India, he played a crucial role in the company's strategic growth and establishing ArcelorMittal's presence in India through the acquisition of Essar Steel, now known as AM/NS India. Mr. Sharma's journey with ArcelorMittal began in 2001, where he has since taken on various roles, including General Manager of Mergers and Acquisitions, CEO of VAMA, and COO at Hunan Valin Steel. Prior to ArcelorMittal, Mr. Sharma worked with McKinsey & Company and the Steel Authority of India Limited. In 2019, he was appointed to the board of China Oriental, one of the largest joint ventures in the Chinese steel industry. In addition to his professional roles, Mr. Sharma is recognized for his thought leadership and is a regular speaker at prominent forums on behalf of ArcelorMittal, such as the World Economic Forum.

3. Need for a new age HEI in India

This section articulates the imperative for establishing a new-age HEI in India. It delves into the evolving educational landscape, the demands of the 21st-century economy, and the need for innovative and flexible learning environments. By examining current gaps and future opportunities, this section underscores the critical role a new-age HEI can play in fostering academic excellence, innovation, and societal impact.

In this rapidly evolving global economy, India's aspirations to position itself as a $5 trillion economy by 2030 [13] highlights the urgent need for a robust and adaptable education ecosystem. Manufacturing is one of the pivotal sectors for economic growth, that requires highly skilled professionals equipped with technical and managerial expertise, innovation capabilities, and a deep understanding of sustainability principles.

Figure 2 : Reasons why manufacturing is key to economic growth.

However, India's current higher education infrastructure faces significant gaps in meeting these demands, particularly in engineering management education, where skill deficiencies and outdated methodologies hinder both individual and national progress.

<u>Current Gaps in Education and Skills Ecosystem for Manufacturing</u>

India's manufacturing sector is poised for significant growth, driven by the nation's vision to become a global manufacturing hub. However, this progress is hindered by a glaring shortage of techno-managerial talent—professionals equipped with both technical

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[13] India to be $5 trillion economy in Amrit Kaal - Fortune India

expertise and managerial skills, which are crucial to meet the sector's evolving demands. Quantitatively, around 1.5 million engineers graduate annually, yet four-fifths of them are unemployable[14]. This stark contrast between the supply of such graduates and industry demands reveals crucial issues in educational quality, which can be broken down into five primary competency gaps:

- **Awareness Gap:** Many students have limited awareness of both existing and emerging technologies, such as artificial intelligence (AI), robotics, and 3D printing. Furthermore, there is a lack of comprehensive understanding of the role of engineers in adopting emerging technologies in the industries and promoting sustainable development in society and the economy. This gap limits their potential and abilities.
- **Knowledge Gap:** Outdated curriculum prevalent in most HEIs leads to an insufficient knowledge of current technological developments, limiting student's ability to adapt to modern industry practices. Consequently, firms that hire them are found to be investing a considerable amount of time and resources in their alignment. For a holistic understanding of the manufacturing sector, there is a need for talent that has both technical and managerial knowledge.
- **Skill Gap:** Despite theoretical training, students lack hands-on experience and practical application, which makes them ill-prepared to contribute effectively to dynamic work environments, particularly high-tech manufacturing industries requiring a practical approach. Additionally, the skills are learned in silos in the current academic design without correlating them to practical application resulting in poor quality of the workforce.
- **Attitude Gap:** Meta Skills like communication and collaboration, which are becoming more and more essential in interdisciplinary workplaces, are often lacking among engineering graduates. This shortfall negatively impacts student's ability to work effectively within teams and adapt to cross-functional roles.
- **Imagination Gap:** The current educational models do not very often assess students on critical thinking and creativity. As a result, graduates tend to lack the ability to design, innovate, and implement novel solutions. These skills are essential in driving progress across sectors including smart manufacturing, semiconductor manufacturing, smart automotive systems, sustainable engineering, etc.

The five gaps mentioned above indicate that there is a lack of capacity to produce such specialized talent, leaving multinational corporations with no choice but to send Indian employees abroad for training. This not only escalates costs but also delays the development of a robust domestic talent pool. The limited availability of skilled

[14] Four-fifth of graduate engineers unemployable - The Economic Times

professionals, coupled with low competency levels, poses a critical challenge to the manufacturing sector's expansion. Addressing this gap necessitates the establishment of a new-age HEI designed to deliver industry-aligned, interdisciplinary programs. Such an institution would play a transformative role in providing the talent required to fuel the manufacturing sector's growth and drive India's aspirations as a global manufacturing leader.

Government Initiatives and Policy Response

Recognizing these challenges, the Indian government introduced the National Education Policy (NEP) 2020, aimed at overhauling the educational landscape and aligning it with the needs of the Indian economy. The policy emphasizes multidisciplinary education, modularity, flexible learning pathways including multiple entries and exits, industry alignment, and digital integration. While NEP 2020 provides a strong policy foundation, the effective implementation of these reforms remains a challenge across many institutions probably rooted in traditional curriculum structures and resistance to change.

Why a New-Age HEI is Essential?

To bridge the gaps that institutions struggle with, a new-age HEI is necessary – one that operates free from the constraints of outdated curriculum and pedagogy models. Such an institution can embrace NEP’s directions and foster academic excellence and societal impact at scale. Specifically, the proposed new-age HEI would play a transformative role by:

- **Driving Innovation and Research:** A new-age HEI with a focus on advanced applied research in the identified strategic sectors (smart manufacturing, semiconductor manufacturing, smart automotive systems, sustainable engineering, etc.) is critical for India’s economic growth. By fostering partnerships with industry leaders, the institution can equip students with the knowledge and skills to work on cutting-edge technologies and develop solutions tailored to national and global challenges.
- **Creating a Talent Pool for Strategic Sectors:** Strategic sectors, such as smart manufacturing, semiconductor manufacturing, smart automotive systems, sustainable engineering, etc. are vital to India’s geopolitical ambitions. A dedicated focus on these areas within a new-age HEI would create a steady pipeline of talent equipped with the technical knowledge needed to strengthen these industries, thereby enhancing India’s global standing.
- **Promoting Sustainable Growth:** To achieve sustainable manufacturing growth, the HEI will integrate sustainability principles into its curriculum, ensuring that graduates not only understand but also prioritize environmentally responsible practices. This aligns with India’s commitment to sustainable development goals and helps position the country as one of the leaders in green manufacturing.

- **Scaling Excellence:** While Institutes of National Importance and Institutes of Eminence are poised as the islands of excellence. These institutes are producing only 50,000 (out of 1.5 million) engineers capable of meeting high industry standards each year which is insufficient to drive broad-based economic growth. A new-age institution must focus on providing excellence at scale, and deliver high-quality outcomes to address the demand and supply gap.
- **Flexible and Adaptive Learning Environment:** Unlike traditional models, the new HEI can adopt a modular approach that allows students to acquire multidisciplinary competencies. This adaptability is essential in a world where applications of technology in the industry are rapidly evolving.

Proposed Deemed-to-be University as a Model

Based on the above, the proposed Deemed-to-be University will serve as the quintessential new-age HEI that India requires to bridge the existing gaps in engineering management education. By offering students hands-on experience with industry-relevant technologies, interdisciplinary projects, and real-world problem-solving tasks, the proposed Deemed-to-be University will cultivate a robust, industry-ready workforce. It will set a benchmark by leveraging digital tools for blended learning, ensuring both accessibility and scalability across diverse student demographics.

Furthermore, it will pioneer applied research initiatives, fostering a culture of innovation and excellence. The curriculum will be meticulously designed to integrate technology, design, and management, thereby producing well-rounded, **Conscious Technologists**. These graduates will not only possess the technical acumen but also the managerial expertise and innovative mindset necessary to drive the manufacturing sector forward.

By focusing on sustainability principles within its educational framework, the Deemed-to-be University will align with India's commitment to sustainable development goals, positioning itself as a leader in green manufacturing education. It will also address the critical demand-supply gap by scaling excellence, ensuring that a larger number of graduates meet high industry standards.

Ultimately, the proposed Deemed-to-be University will be instrumental in providing the specialized manufacturing talent that India needs to achieve its aspirations of becoming a global manufacturing leader. Through its comprehensive and forward-thinking approach, it will transform the educational landscape and significantly contribute to the nation's economic growth and global standing by becoming a model institution for other HEIs,

4. Introduction to the proposed Deemed-to-be University - New Age Makers' Institute of Technology (NAMTECH)

This section introduces the New Age Makers' Institute of Technology (NAMTECH), the proposed Deemed-to-be University dedicated to pioneering advancements in the manufacturing sector. The section will detail NAMTECH's vision, mission, objectives, value proposition, and notable achievements to date, highlighting its commitment to shaping the future of higher education.

AM/NS India and Ramarang Seva Trust have together launched an initiative in higher education called New Age Makers' Institute of Technology (NAMTECH) with New Age Education and Skills Foundation (NAESF) as its sponsoring body. NAMTECH aims to foster an Industry 4.0 workforce tailored for the manufacturing sector in India. By investing in education, training programs, and initiatives that empower individuals to acquire and hone advanced skills, NAMTECH aims to bridge the gap between the demand for industry 4.0-ready professionals and the available talent pool.

NAMTECH commenced operations in August 2022 from its transitory campus at IIT Gandhinagar Research Park and currently has the following two schools operational:

1. School of Manufacturing Technologies

School of Manufacturing offers multiple types of programs including a one-year International Professional Masters Program (iPMP), one-year International Professional Technologist Program (iPTP), Micro Masters, and Masterclass catering to different segments of society. The school, going forward will also perform applied research in their respective domains.

The inaugural cohort of its flagship iPMP in Smart Manufacturing under the School of Manufacturing Technologies began in September 2023. This program was developed in collaboration with the Technical University of Munich (TUM) Asia, Singapore, and several industry partners including Festo, Siemens, and Schneider.

2. School of Social Impact

NAMTECH School of Social Impact in collaboration with the Institute of Technical Education (ITEES) in Singapore and Carnegie Mellon is strengthening ITI education in the country, ensuring that learners are well-prepared to enter the industry.

In line with this, NAMTECH has launched the pilot initiative for the Outreach Program – iPTP Certificate Program. Eleven government ITIs (five Hub and six Spoke ITIs) have been onboarded. Additionally, physical spaces for five Smart Labs and five Digital Labs have been created in Hub ITIs, and cutting-edge machines and simulators have been installed. NAMTECH has also launched the mobile lab - NAMTECH Moving CAMPUS – Lab on Wheels (FESTO Bus), to cater to the six Spoke ITIs. The initiative includes interventions to bring in practices by leading institutes to measure student progress, support Personalized Adaptive Learning (PAL), and assess learning outcomes. This program has registered 1,500 students and integrated 298 hours of content through physical and digital modules.

NAMTECH has made significant strides during the 2023-24 academic year, with ambitious plans and initiatives underway for 2024-25, laying the foundation for its continued growth and expansion.

4.1 Vision

NAESF would establish the proposed Deemed-to-be University in line with NEP 2020's vision as its core. The basic building block of the proposed new age Deemed-to-be University will be a competency-based curriculum and choice-based credit system to provide high-quality holistic education.

To be a new-age institution that **inspires humane capital** and creates a cadre of **conscious technologists**.

4.2 Mission

The proposed Deemed-to-be University will achieve its vision by ensuring learner-centricity and bridging the competency gaps with a strong emphasis on immersive and experiential learning. Elements like internships and project-based learning across the programs will outlay a strong industry emphasis. The proposed Deemed-to-be University would be a testament to NAESF's commitment to creating high-impact, long-term socio-economic value and supporting the nation's growth at a larger scale.

Impact 3 million learners in next 10 years

4.3 Objective

The objectives of the proposed Deemed-to-be University are stated below:

#	Objectives
1	Provide for higher education leading to excellence and innovations in such branches of knowledge as may be deemed fit, primarily at post-graduate, and research degree levels, fully conforming to the concept of a university.
2	Engage in inter-disciplinary, multi-disciplinary, trans-disciplinary teaching and research in addition to domain-specific specialization.

#	Objectives
3	Provide for high-quality teaching and research recognized nationally and globally.
4	Recognize, identify, and foster the unique capabilities of each student, by sensitizing teachers as well as parents to promote each student's holistic development.
5	Provide multi-disciplinary and holistic education.
6	Transform into a research and teaching-intensive university over a period.
7	Focus on research and innovation by setting up start-up incubation centers; centers in frontier areas of applied research; greater industry-academic linkages; and inter-disciplinary research including social sciences and learning engineering research.
8	Provide flexible and innovative curriculum, which includes credit-based courses and projects in the areas of community engagement and service, environmental education, value-based education, etc.
9	Contribute to social transformation through socially responsive teaching, learning, research, fieldwork, and outreach programs.
10	Adopt the provisions of NEP, 2020 by implementing multiple entry and exit options along with a credit transfer facility.
11	Strengthen the research ecosystem by establishing a Research and Development Cell (RDC).

Table 1 : Objectives of the Proposed Deemed-to-be University.

4.4 Value Proposition

To realize its vision and mission, the proposed Deemed-to-be University shall align itself to the following aspects which will serve as its unique value proposition, guiding its journey to educate and grooming industry-ready professionals targeted at Industry 4.0 and hence impact lives globally.

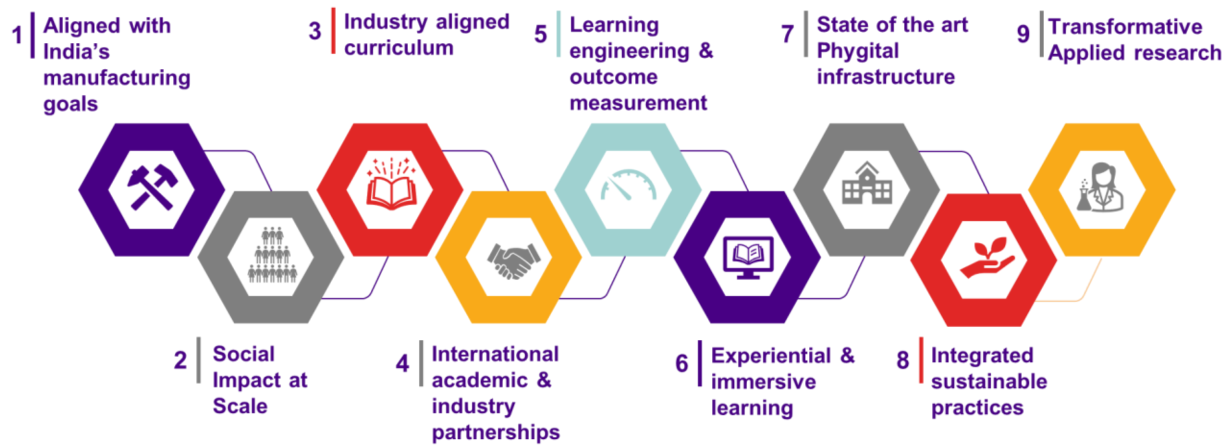

Figure 3 : Key features of the proposed value proposition

<u>Aligned with India's manufacturing goals.</u>

The proposed Deemed-to-be University will stand firmly aligned with strategic Indian goals related to the manufacturing sector, as laid out in key government initiatives such as Viksit Bharat 2047, Make in India, and Atmanirbhar Bharat. Being an educational institution, the proposed Deemed-to-be University will also carefully consider and implement the directives under NEP 2020.

- The proposed Deemed-to-be University will be committed to creating industry-ready professionals and encouraging innovation through impactful applied research. This aligns with the Viksit Bharat 2047 initiative and its visionary goal of nurturing India into a flourishing $30 trillion economy by 2047.
- The proposed Deemed-to-be University diligently plans to enable the Make in India initiative's intent, amplifying India's global status as a preferred manufacturing destination. To this end, the proposed Deemed-to-be University will invest in the cultivation of requisite talent and fortify the MSME ecosystem through comprehensive institutional support and extensive outreach activities.
- Nestled within the Atmanirbhar Bharat initiative's ambition of fostering self-reliance and national independence, the proposed Deemed-to-be University's Maker's philosophy will be at play. By nurturing innovation and motivating local product creation, the proposed Deemed-to-be University aims to substantively contribute to national self-reliance.

The proposed Deemed-to-be University will be dedicated to fostering humane capital, innovation, and economic competitiveness. Human capabilities act as capital that can be deployed to create prosperous societies and economies. To foster this capital the deployment should be such that it does not exploit humans or nature in general, i.e., in a humane way. The proposed Deemed-to-be University through its ecosystem and deeds inspires to create and deploy such "humane capital" that will be able to address existing and emerging opportunities in the country.

Social Impact at Scale

The Indian youth is critically falling short of meeting the rapidly evolving needs of the manufacturing sector. Currently, only 48% of seats at Industrial Training Institutes (ITIs) are being utilized, and India could face a skill gap of 85-90 million by 2030. High-performing skilling providers report an approximately 40% drop-out rate between placement and retention in employment for three months. Additionally, average placement rates among middle and low-graded ITIs are around 30%, with only 5% of students earning more than ₹20,000 per month after placement.

The proposed Deemed-to-be University aims to align with India's mission to build a globally competitive manufacturing workforce by transforming the TVET ecosystem. Through on-campus and outreach programs, the proposed Deemed-to-be University will leverage its intellectual capital to empower ITI students, building their aspirations, confidence, and skillsets. This approach will address the critical need for quality outcomes at scale, positioning it as a key player in improving technical education and workforce readiness in India.

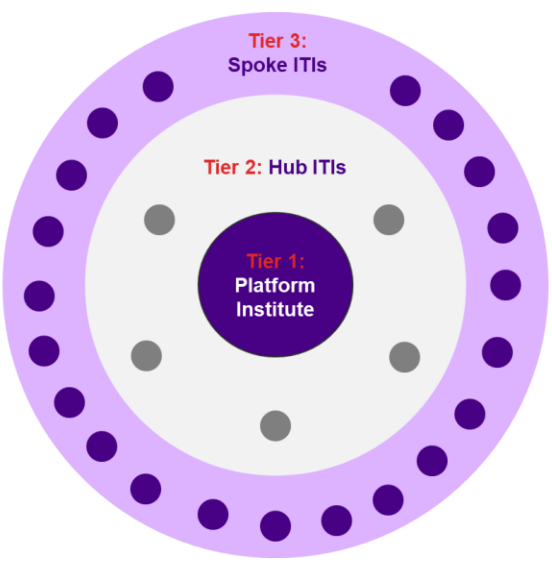

Figure 4 : Three-tiered cluster model for Outreach

The proposed Deemed-to-be University will utilize a three-tiered cluster model to achieve these outcomes at scale. The Center for Community Outreach will utilize an innovative hub-and-spoke model with the proposed Deemed-to-be University acting as the platform institute overseeing multiple hubs, each managing a network of spoke ITIs. Each hub-centric ITI will be transformed into a specialized center focused on a specific trade discipline. This transformation will include the professional development of staff and the construction of advanced labs for project-based, hands-on technical training, fostering an environment that maximizes student growth and skill development.

This model will facilitate the efficient distribution of resources, learning, and mentoring across a broad network of institutions and learners. With this initiative, the aim is to create an institute of one of its kind that bridges the gap between skills in the ITI ecosystem and engineering education.

In its first phase, the center aims to reach 160 ITIs and impact 120,000 students over five years, providing them with cutting-edge skills and training to meet industry demands. This large-scale intervention is poised to transform the technical education landscape, ensuring a steady supply of a skilled workforce ready for the future.

Industry-aligned curriculum

The proposed Deemed-to-be University envisions developing an industry-aligned curriculum catering to the needs of the industry. The proposed Deemed-to-be University will collaborate with industry experts and global institutions known for excellence in specific sectors, who will offer their expertise and knowledge towards designing the curriculum.

The students will be equipped with the knowledge and skills necessary to succeed in the industry, offering them a competitive edge in securing employment opportunities in the 21st century's rapidly changing job markets.

To achieve this goal the envisioned curriculum will include technical skills, managerial skills, global exposure as well as hands-on experience, providing students with comprehensive competencies essential to thrive in the industry. This curriculum acknowledges the needs of the industry and aims to provide students with practical experience, theoretical foundations, and industry insights. Thus, students will graduate with the skills necessary to take up managerial roles, becoming **industry-ready Techno-managers.**

International academic & industry partnerships

The proposed Deemed-to-be University will establish partnerships with top educational institutions and leading industry players across the world. Each school at the proposed Deemed-to-be University will have an anchor academic and an anchor industry partner who will be the fundamental partners, helping in setting up of the schools. In addition to these anchor partners, there will be multiple other partners.

An area of focus for forming academic partnerships will be curriculum development and providing students with unique programs, global perspectives, and enhanced employment opportunities. Additionally, these partnerships will help ideate and develop cutting-edge laboratory facilities and attract, and retain the best faculty, researchers, and experts. The proposed Deemed-to-be University will jointly work on research and development projects with partner institutes enabling it to position itself among the key academically advanced institutions.

The industry partners of the proposed Deemed-to-be University will play a crucial role in supporting infrastructure development, developing industry-relevant curriculum, offering training opportunities like internships and capstone projects, driving social impact, and contributing to financial aid initiatives. Moreover, practitioners from the industry will contribute by taking guest lectures on specific industry-aligned topics through a case study-based approach.

The contributions of industry partners will enable students and faculty to engage in real-world projects, gain exposure to the latest technologies, and develop skills for the workplace of the future. By fostering mutually beneficial relationships, the aim is to enhance the learning ecosystem by strengthening the program offerings, research opportunities and outcomes, placement opportunities, and hands-on learning experiences.

Learning engineering & outcome measurement

NEP 2020 places a strong emphasis on the measurement and enhancement of learning outcomes. To achieve this goal, NEP 2020 out lays competency-based assessments as well as the importance of professional development for educators for successful implementation of Outcomes Based Education (OBE).

In line with the goals of NEP 2020, the proposed Deemed-to-be University will focus on innovative approaches to learning through the concept of Learning Engineering. Learning Engineering is a process and practice that applies the learning sciences using instructional design methodologies and data-informed decision-making to support learners and their development. The Learning Sciences framework enables the scientific measurement of learning outcomes. Meanwhile, instructional design creates engaging content based on feedback from data analysis. Finally, the Data informed decision-making process enables the collection of data related to learning outcome measurement, learner engagement, and learning quality, which allows for the adaptation of the learning process to account for the learner's behavior.

Leveraging the learning engineering methodology, the proposed Deemed-to-be University will offer a personalized adaptive learning mechanism, accelerated learning pathways, and flexibility to gauge their skill sets better. The design of the curriculum will be data-driven, and improved feedback mechanisms will be established for effective learning. This approach can enhance the student learning experience by gauging a better understanding of possible gaps and students' learning outcomes.

Experiential & Immersive Learning

To achieve this vision the proposed Deemed-to-be University plans on creating an experiential and immersive learning environment promoting students' creativity and innovation, while also offering them a distinctive and dynamic educational experience.

To promote these ideas the proposed Deemed-to-be University will develop a flipped classroom model, industry-simulated labs, digital labs, AR/ VR labs, and digital factories for replicating the industry environment in an academic atmosphere resulting in an immersive experience and learning tools for students. This will be supplemented by the creation of dedicated interactive learning spaces for activity-based discussions and case studies encouraging peer-to-peer learning to inculcate the concept of "design-and-make" in the students.

State-of-the-art Phygital infrastructure

The proposed Deemed-to-be University will establish a cutting-edge state-of-the-art Phygital infrastructure including advanced lab facilities comprising the latest technologies like AR/VR, simulation, mini-factories, digital labs, and digital factories that mimic real-world systems. This will enable students to gain a holistic understanding of processes, master components, gain practical experience, and learn real-world scenarios effectively.

To keep pace with the digital revolution and prepare students for the future, the proposed Deemed-to-be University will build its Information and Communication Technology (ICT) infrastructure around a digital-first philosophy and enable continuous learning across classrooms, labs, industry settings, and beyond. Key technologies like cloud-based Learning Management Systems (LMS), Student Information Systems (SIS), and Enterprise Resource Planning (ERP) systems will support both academic and administrative operations, ensuring robust internal and external reporting, dashboarding, and monitoring. The digital-first approach will provide students with a seamless and efficient learning experience, offering enhanced flexibility, accessibility, and engagement.

In addition to the Phygital infrastructure, the proposed Deemed-to-be University will develop AI-enabled learning spaces and recreational facilities including student breakout spots, gyms, amphitheaters, etc.

Integrated sustainability practices

The proposed Deemed-to-be University aims to create a ***'conscious technologist'*** with a multi-disciplinary competency profile. The objective is to develop and apply technology to augment individual and societal capabilities to innovate and solve problems.

To develop the conscious mindset sustainability practices will be a core pillar of all programs offered instilling a sense of responsibility towards the environment and society, making them conscious of their impact on the world around them. Moreover, to support the vision of creating a conscious technologist the campus will have a living laboratory, which will serve as a test bed for innovative sustainability practices and technologies. The laboratory will offer students the opportunity to engage in real-world projects addressing local environmental challenges.

Transformative Applied Research

Applied research provides practical solutions to specific business problems by pointing the business in the right direction. It aims to simultaneously investigate and solve an issue, that is working on TRL Levels 4 through 8. The proposed Deemed-to-be University will generate market-ready, tangible research with lasting impacts on both the regional and national economies through its focus on applied research by devising innovative products and solutions for both industry and societal challenges.

The proposed Deemed-to-be University will form research clusters centered around vital national and state-level priorities, including clean energy, sustainable solutions, and smart manufacturing, among others. Interdisciplinary teams within these clusters will engage with projects with industries in the form of consulting services to propose practical solutions. This approach will be powered by a maker philosophy, propelling faculty, and students to undertake applied research that culminates in prototypes, patents, and product development. The focal point of this exercise will be to ensure that research outputs contribute significantly to both academic progression as well as economic development.

4.5 Achievements of NAMTECH

Within two years of the operations, NAMTECH has been able to bring in internationally well-renowned faculty from institutes like Carnegie Mellon University, TUM Asia, Colorado School of Mines, FESTO, Schneider, etc. which has significantly helped students in their learning journey. Additionally, the case study-based approach, exposure to advanced technologies, advanced labs, and student immersion have significantly aided experiential learning resulting in world-class outcomes at the WorldSkills Competition.

Securing First-Ever Bronze for India in Industry 4.0 Category at WorldSkills Lyon (France) 2024

The WorldSkills Competition, also known as the '*Olympics of Skills*' was founded in 1950, is a prestigious global event that in 2024 brought together young professionals from 89 countries to compete in over 60 skills categories. Held biennially, it aims to inspire excellence in skills development, highlighting expertise in fields from IT and manufacturing to creative arts and social services. By fostering international cooperation and best practices, WorldSkills highlights the importance of skilled professions and encourages youth to pursue careers in these fields, thereby contributing to global workforce growth and innovation.

At the 47th edition of the WorldSkills competition held in Lyon, France in September 2024, over 1,400 participants from more than seventy countries competed in diverse skill categories. India participated in 52 categories, and achieved remarkable success, winning four bronze medals in Industry 4.0, Renewable Energy, Patisserie and Confectionery, and Hotel Reception, along with earning 12 Medallions of Excellence.

Figure 5 : Lyon WorldSkills 2024

Two NAMTECH students represented India and participated in the Industry 4.0 category – Mr. Dhrumil Kumar Gandhi and Mr. Satyajit Balakrishnan, students of iPMP in Smart Manufacturing won the Bronze Medal in the Industry 4.0 category, introduced in 2024. Both students have a background in Mechanical Engineering and joined the program to enhance their skills in automation, AI, and data analytics, which are crucial for modern industrial operations.

Industry 4.0 skills call for a complete set of competencies related to Manufacturing Execution Systems (MES), automation (simulation, digital twin), connectivity (cloud computing, cybersecurity, IIoT), and intelligence (data analytics & visualization, AI, and ML). These skills are the future of key workforce requirements for companies to successfully navigate the fast-evolving digital environment.

Figure 6 : NAMTECH student who won bronze at WorldSkills Lyon 2024

The competition was a grueling one spread over 5 days involving multiple real-time challenges. This win is a testimony to Satyajit and Dhrumil's knowledge, skills, and ability to manage time and competition pressure.

This is India's first medal on a global stage for a specialized engineering discipline. This win reflects NAMTECH's innovative approach to education in action: fostering the core value of being a **conscious technologist** in today's digital-first world. The experiential learning model prioritizes firsthand experience, equipping students with the skills needed to thrive in an evolving industrial landscape. Additionally, NAMTECH's state-of-the-art campus in Gujarat, with industry-grade tools and simulated labs, prepares students to confidently confront real-world challenges.

Figure 7 : NAMTECH students at WorldSkills along with faculty mentor

There is no better example of this model in practice than the support and guidance students received from their faculty mentor, Mr. Dishank Upadhyay. He is a Senior Lecturer at NAMTECH and is now a certified WorldSkills Assessor in Smart Manufacturing. Mr. Upadhyay has also been appointed as a WorldSkills Expert. He has been instrumental in training and preparing NAMTECH's candidates for World Skills. He imparted training on various aspects including CIROS, Webshop, MES, NETLAB, TIA & PLC Programming, Augmented Reality, Digital Twin, Smart Sensor Integration, Energy Monitoring, IOT Camera integration, Measurement Station working, Dashboard creation & Node-red, Factory views, Email services (Thunderbird portal), and SQL data handling. Further, he helped the candidates in the preparation of various test projects and provided critical inputs facilitating the awards.

In conclusion, NAMTECH stands as a beacon of new-age education, driven by a clear vision and mission to foster innovation and excellence. The outlined objectives and value proposition underscore its unique position in the educational landscape, while its achievements reflect a strong foundation for future growth. NAMTECH is poised to make significant contributions to the field of manufacturing and beyond, embodying the principles of a new-age institution dedicated to transformative education and applied research.

5. Formation of a Deemed-to-be University under 'Distinct Category' and alignment with the guidelines

This section outlines the proposed Deemed-to-be University's alignment with the regulatory guidelines and the criteria for its formation under the 'Distinct Category.' It provides a detailed examination of unique characteristics that qualify the proposed Deemed-to-be University for this prestigious designation.

University Grants Commission (UGC) (Institutions Deemed-to-be Universities) Regulations, 2023 released in June 2023 defines 'distinct category' as:

*"An institution starting from the beginning with the **focus on teaching** or research **in the unique disciplines** or **addressing the strategic needs of the country** or engaged in the preservation of Indian cultural heritage or **preservation of the environment** or dedicated to skill development or dedicated to sports or languages or any other discipline, as so determined by the Expert Committee approved by the Chairman of the Commission."*

The proposed Deemed-to-be University seamlessly aligns with the criteria laid down by UGC for attaining the Deemed-to-be University 'distinct category' status in several ways as stated below:

- Focus on addressing the strategic needs of the country.
- Focus on Teaching and research in unique discipline(s)
- Engage in the preservation of the environment.

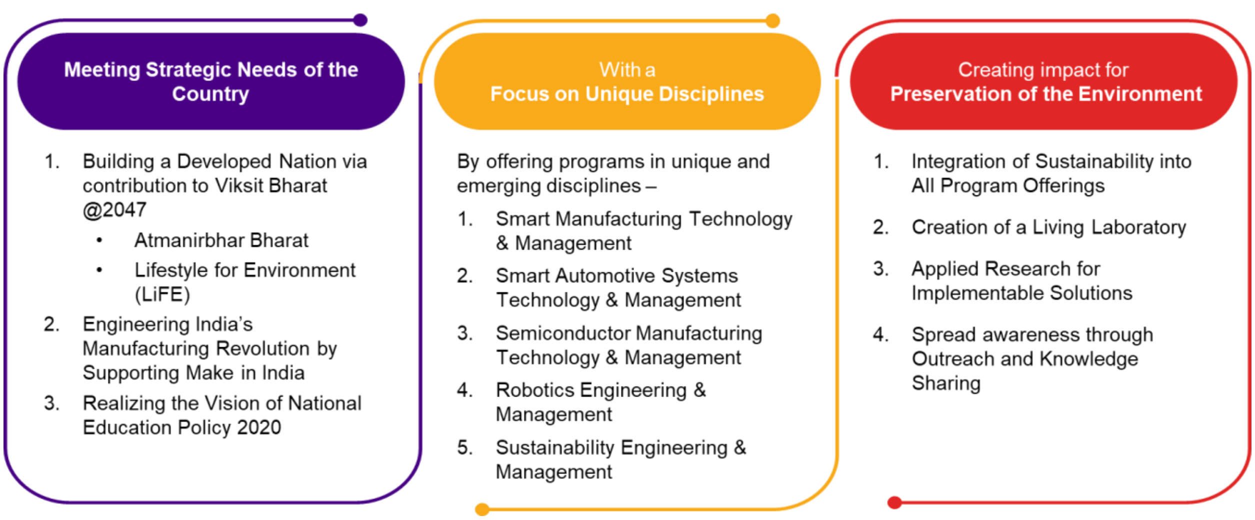

Figure 8 : Focus areas of the proposed Deemed-to-be University.

5.1 Meeting Strategic Needs of the Country

The proposed Deemed-to-be University will be committed to supporting India's strategic goals by developing an industry-ready workforce through an industry-aligned curriculum and driving indigenous innovation through applied research. By aligning the academic programs with key national policies, initiatives, and the strategic needs of the country, the aim is to help shape a self-reliant, technologically advanced, and sustainable future for India.

Further, the proposed Deemed-to-be University's commitment to sustainability is woven into the very fabric of the curriculum and is also aligned with the **Lifestyle for Environment (LiFE) initiative**. By incorporating sustainable practices in education, research, and its operations, it will be creating environmentally conscious technologists who will champion the cause of responsible development and contribute to a more sustainable and greener India.

- **Building a Developed Nation: Contribution to Viksit Bharat @2047**

  In line with India's vision of becoming a developed nation and achieving a $30 trillion economy by 2047, the manufacturing industry is poised to play a pivotal role. To reach this ambitious goal, India will require a 16-fold growth in the manufacturing sector over the next 23 years. Additionally, the country will need to sustain an annual GDP growth rate of over 9%. Achieving this will necessitate enabling ecosystems comprising new-age HEIs focused on the applied sciences manufacturing landscape. These institutions will be crucial in creating a talented workforce and developing indigenous innovations through focused research. The proposed Deemed-to-be University aims to be a leader in cutting-edge fields such as smart manufacturing, advanced robotics, and sustainability. It will educate learners and provide the industry with relevant solutions, ensuring the creation of a workforce ready to fulfill the nation's technological needs and lead economic transformation.

- **Engineering India's Manufacturing Revolution: Supporting Make in India**

  The Make in India initiative was launched in 2014 as part of a wider set of nation-building initiatives devised to transform India into a global design and manufacturing hub. The academic programs at the proposed Deemed-to-be University will be designed in collaboration with global industry and academic partners to support India's industrial ambitions by promoting and teaching advanced manufacturing technologies. By creating highly competent professionals in the fields the proposed Deemed-to-be University will directly contribute to the success of Make in India, positioning India as a key player in global manufacturing.

  As India enters the age of smart factories and digital manufacturing, the proposed Deemed-to-be University's focus on advanced technologies like AI and industrial robotics positions it as a leader aligned with India's vision of becoming 'Atmanirbhar'.

The Production Linked Incentive (PLI) Schemes that were introduced to enhance the country’s manufacturing capabilities and boost exports with an impressive outlay of ₹1.97 lakh Cr (over US$26 billion) covers 14 key sectors aimed at fostering investment in cutting-edge technology and promoting global competitiveness. The proposed Deemed-to-be University is aligned with 6 of those key sectors. Furthermore, India's semiconductor ecosystem has gained significant momentum, with several landmark projects receiving approval. Notably, India has crafted policies that support every segment of the semiconductor ecosystem, extending beyond just fabrication plants (fabs) to include packaging, display technologies, Outsourced Semiconductor Assembly and Testing (OSAT), sensors, and more.

For supporting the Semiconductor Mission and PLI Scheme the proposed Deemed-to-be University will play a pivotal role in providing the required workforce equipped with the knowledge of semiconductor manufacturing, scale, automation, and data-driven manufacturing, essential for driving the Nation’s industrial transformation.

- **Shaping the Future of Education: Realizing the Vision of National Education Policy 2020**

The proposed Deemed-to-be University will fully embrace the transformative goals of NEP 2020 in the following ways:

1. Fostering multidisciplinary learning, creativity, and research.
2. Through academic programs that encourage practical knowledge application and industry readiness.
3. Imaginative and flexible curricular structures enabling multidisciplinary learning with multiple entry and exit points.
4. Offer different designs of the Post Graduate Program
    - A 2-year program with the second year devoted entirely to research.
    - A 1-year program
5. Graduate-level education, providing rigorous research-based specialization, providing opportunities for work in academia, government, and industry.
6. An Academic Bank of Credit (ABC) shall be established which would digitally store the academic credits earned from the proposed Deemed-to-be University. These credits can be utilized when pursuing various academic pathways offered.
7. Improving learning outcomes by measuring gaps in student understanding. These identified gaps will be used to form a personalized learning path for the students helping to mitigate and address the gaps and weak links.

8. Perform research in education and teaching methodologies benchmarked by learning outcomes to create continuously improving system.
9. Focus on shaping a new generation of thinkers and innovators, equipped to navigate the challenges of an evolving global landscape by focusing on a learning by doing approach.

By aligning the proposed Deemed-to-be University's goals with NEP 2020, it is ready to stand to address the critical needs and education gaps of the Nation.

5.2 Teaching Unique Disciplines

The proposed Deemed-to-be University will stand at the forefront of innovation, offering a unique blend of teaching and applied research in disciplines critical to India's industrial future. Unlike other institutions in the country, the proposed Deemed-to-be University's programs will be crafted in collaboration with industry to address the pressing needs of emerging technologies. This alignment with the nation's aspirations for technological self-reliance and global competitiveness sets it apart.

The programs will be a mix of **Technology, Design, Management and Sustainability** modules which will provide the student with an all-round learning experience. The Technology and Design modules will consist knowledge of the unique discipline, the Management modules will consist of skills such as communication, management, and project management etc. and the Sustainability modules will focus on sustainable manufacturing practices. All these modules combined will enable students to become a **conscious techno-manager**.

The proposed Deemed-to-be University will offer programs in following domains -

1. The **Smart Manufacturing Technology and Management** program will delve into the integration of advanced digital technologies such as IIoT, AI, and automation with traditional manufacturing processes and management. This is an area where India has immense potential to drive global competitiveness, yet few institutions are offering comprehensive courses in this discipline.
2. The program with focus on **Smart Automotive Systems Technology and Management**, will explore the convergence of cutting-edge digital technologies, including connected vehicles, autonomous driving, and advanced telematics, with traditional automotive engineering and management practices. This field holds significant promise for enhancing India's global competitiveness in the automotive sector.
3. The focus on **Semiconductor Manufacturing Technology and Management** addresses a crucial gap in the national capacity to build domestic expertise in an industry that is foundational for nearly all technological advancements. As India seeks

to establish itself as a player in the global semiconductor supply chain, this program will cultivate professionals who can support and lead this strategic shift.

4. The **Robotics Engineering and Management** program will prepare students for the future of automation, focusing on the integration of robotics into manufacturing environments, which is a key driver of productivity and innovation in advanced economies.
5. **Sustainability Engineering and Management** will be a core pillar for the proposed Deemed-to-be University, embedded across programs but also with a dedicated focus program. India's commitment to reducing carbon emissions and promoting sustainable practices across industries requires a new generation of professionals who are equipped to lead this change.

5.3 Preservation of the Environment

In today's world, the urgency of addressing sustainability cannot be overstated. As environmental challenges intensify and resources become threatened, it is imperative for nations to prioritize sustainable development. The proposed Deemed-to-be University recognizes this critical ask and is committed to integrating sustainability into every aspect of its academic and operational framework. By embedding sustainability principles across all program offerings, creating a Living Laboratory for experiential learning, conducting applied research for practical solutions, and engaging in extensive outreach and knowledge sharing, the proposed Deemed-to-be University aims to cultivate a generation of conscious technologists and technicians. These efforts will not only address local and national environmental challenges but also contribute to the global pursuit of a sustainable future.

- **Integration of Sustainability into all Program Offerings**

  The proposed Deemed-to-be University is committed to embedding sustainability principles across all academic programs. Each program will incorporate modules on sustainable behavior, energy transitions and circularity. By promoting an interdisciplinary approach, the aim is to equip students with the requisite knowledge and skills to tackle sustainable manufacturing.

- **Creation of a Living Laboratory**

  To enhance experiential learning, the proposed Deemed-to-be University will establish a "Living Laboratory" on campus. This dynamic environment will serve as a test bed for innovative sustainability practices and technologies. Students and faculty will collaborate on real-world projects addressing local environmental challenges, facilitating the practical application of theoretical knowledge. The Living Laboratory will not only enrich learning experiences but also generate implementable solutions that benefit the community and contribute to broader environmental objectives.

- **Applied Research for Implementable Solutions**

  The proposed Deemed-to-be University is dedicated to conducting applied research that yields implementable solutions to pressing challenges faced by the industries. The faculty and students will engage in collaborative research initiatives focused on developing sustainable solutions. By prioritizing research with tangible impacts, the aim is to contribute to the body of knowledge while addressing societal and environmental needs.

- **Outreach and Knowledge Sharing**

  Recognizing the responsibility to foster a culture of sustainability beyond the campus, proposed Deemed-to-be University will actively disseminate its expertise and resources through outreach programs. The proposed Deemed-to-be University will organize workshops, seminars, and collaborative projects aimed at promoting sustainable practices and environmental preservation. By building partnerships with other educational institutions, and MSMEs, we will amplify our impact and promote a collective commitment to sustainability.

In conclusion, the proposed Deemed-to-be University demonstrates a robust alignment with the established guidelines and criteria for the ‘Distinct Category’. This alignment is evident in its focus on addressing national priorities, fostering innovation through focus on teaching and doing applied research in unique disciplines and promoting sustainability thereby, also demonstrating the clear need for a forward-thinking institution.

6. Justification for program uniqueness

6.1 Common Distinct features for all the proposed programs

The deemed-to-be-university will cater to India's Viksit Bharat ambitions.

- India has a vision of becoming a **$30 trillion economy by 2047** and for this, the manufacturing industry is poised to play a pivotal role as India will require a **16-fold growth in the manufacturing sector** over the next 23 years.
- The **Production Linked Incentive (PLI) Scheme** covers 14 key sectors aimed at fostering investment in cutting-edge technology and promoting global competitiveness. The proposed Deemed-to-be University is **aligned with 6 of those key sectors**.
- We will educate learners and provide the industry with relevant solutions, ensuring the creation of a **technological workforce** ready to lead the transformation. The skills taught will be of global standards and focused on cutting-edge fields such as **smart manufacturing, semiconductor manufacturing, advanced robotics, sustainability, and automotive systems.**
- We stand aligned with strategic Indian goals related to the manufacturing sector, as laid out in **Viksit Bharat 2047, Make in India, and Atmanirbhar Bharat.**

The proposed deemed-to-be-university aims to achieve quality at scale.

- The capacity for each program will be **600 students at steady state**, a scale that has not been achieved by any other HEI (an average of not more than 20 students – refer to the Annexure 9.1 for details).

Industry-aligned curriculum.

- Each program is designed with the aspects of **Technology, Design, Management and Sustainability** within them.
  - The Technology and Design aspects are as per the discipline area.
  - The **management modules** include Manufacturing Management, Project Management, Operational Excellence, Sustainability, Reliability and Quality for Engineers, and the economic aspects of manufacturing, thus preparing students for leadership roles.
  - While the **Sustainability** courses may include sustainable manufacturing practices, Decarbonization Pathways and ESG Metrics, Circularity etc. to produce graduates who can drive sustainability in industrial settings.
- In the fourth trimester students will work on an **Industry Internship/ Capstone Project**, providing hands-on experience and practical application of learned concepts.

Unique Pedagogy

- Each school will have an **anchor academic and industry partner** who will be the fundamental partners, helping in setting up the schools. In addition to these anchor partners, there will be multiple other partners.
  - Anchor **Academic** partners will support **curriculum** design, and development, provide students **global** perspective, and ideate and develop **cutting-edge laboratory** facilities. Further, they will jointly work on **research** projects with partner institutes.
  - Anchor **Industry** partners will play a crucial role in supporting **infrastructure** development, developing **industry-relevant curriculum**, offering **training** opportunities like internships and capstone projects, take **guest lectures** on specific industry-aligned topics through a case study-based approach.
- Creating an **experiential and immersive learning** environment.
  - **Flipped classroom model** will be used for effective course delivery.
  - **Industry-grade labs:** digital labs, AR/ VR labs, and **mini and digital factories** for replicating the industry environment in an academic atmosphere.
  - Dedicated interactive learning spaces for **activity-based discussions** and **case studies** encouraging peer-to-peer learning to inculcate the concept of "**design-and-make**" in the students.
- **Global Immersion** will be offered to students in the first year of their academic program and will be optional to opt for. (We have an existing partnership with TUM Asia for this, and students undergo global immersion at the Singapore location)

NEP Alignment

- **Modular program structure** with **multiple entry and exit points** allows students to tailor their learning according to their interests.
- **Academic Bank of Credit** (ABC) shall be established to digitally store the academic credits earned which can be utilized for pursuing various academic pathways offered.

6.2 Master in Smart Manufacturing Technology and Management

- *Current projections indicate a required annual growth rate of **8.1 per cent** for smart manufacturing from 2024 to 2029 for India to become a **$30 trillion economy by 2047**.*
- *The program aims to form a workforce proficient in **digital transformation for the manufacturing sector**, capable of leading and optimizing systems with advanced technology, and enhancing India's global manufacturing competitiveness.*

- *The curriculum covers **technology, design, and management modules**. The core modules include topics from PLC Programming to AI in Manufacturing, providing practical skills for handling complex manufacturing processes.*
- *Graduates will be prepared for roles such as **Smart Manufacturing Engineer**, contributing to the digitalization and sustainability of manufacturing.*

Need Analysis of the Program: The need for advanced skills in smart manufacturing is increasingly critical as the industry moves toward digitization and automation. In India, manufacturing represents approximately **17 per cent** of the GDP and employs around **27 million individuals**.[15]. However, a **significant skills gap** exists in areas essential for **Industry 4.0**, such as robotics, AI/ML, IoT, and data analytics. Current projections indicate an annual **growth rate of 8.1 per cent** for smart manufacturing from 2024 to 2029[16], highlighting a strong upward trend in demand. Despite this growth, the talent pool equipped with relevant skills remains limited, with up to **60 per cent of manufacturing firms reporting a gap** in these areas.[17] This mismatch between demand and supply presents a need to bridge this skills gap to support India's strategic goals in manufacturing.

Objective of the program: The primary aim of the proposed program is to develop a specialized workforce capable of driving **digital transformation** within the manufacturing sector. By equipping students with **advanced knowledge and hands-on experience** in smart manufacturing technologies, this program aims to produce leaders who can **innovate, manage, and optimize manufacturing systems** using cutting-edge technology. The program will cater to the industry's critical need for expertise in **technology integration, data-driven decision-making, and sustainable practices,** aligning with the broader goal of strengthening India's manufacturing competitiveness on a global scale.

Curriculum focus: The curriculum of the proposed program is structured to cover key modules in **technology, design, and management** with a strong emphasis on sustainability. The program will integrate technology modules focusing on **Pneumatic and Hydraulic Technologies, PLC Programming, SCADA, and HMI, IIoT, Industrial and Collaborative Robots, Product Design and Rapid Prototyping for Additive Manufacturing, AI in Manufacturing, Data Analytics and Data Visualization, Digitalizing Operation with MES, Digital Twin in Manufacturing** etc. equipping students with practical skills to handle complex manufacturing processes. Design

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[15] India Skill Report 2023: Key Findings on Talent Availability

[16] India Smart Manufacturing Market Analysis | Size & Forecasts

[17] The New-age Skill Gap | Fortune India

modules introduce students to digital tools and techniques for smart product and process design.

Program outcomes: Graduates of this program will emerge with a robust set of skills in smart manufacturing technology, **analytical capabilities, and leadership in operations management**. They will be well-prepared for various **Techno-Managerial** roles including **Smart Manufacturing Engineer, Automation Specialist, Operations Manager, and Data Analyst**, across leading organizations such as **Siemens, ABB, Fanuc, Bosch** etc. in the field. With hands-on expertise and a strong theoretical foundation, they will contribute to the **digital transformation of manufacturing, fostering innovation, efficiency, and sustainability** within their organizations.

6.3 Master in Automotive Systems Technology and Management

- *Current projections indicate an annual **growth rate of 8.2%** for the automotive sector from 2024 to 2029, driven by **technological advancements and increasing consumer demand.***
- *The program aims at fostering leaders skilled in **automotive systems technology** and **management**, catering to the industry's need for expertise in **electric vehicles, autonomous driving, and smart mobility.***
- *The program's technical curriculum encompasses modules from **Product Foundations to Electrification of Products.***
- *Prepares for roles, like **Automotive Systems Engineer and Product Development Manager**, **driving innovation, sustainability, and smart manufacturing** in the automotive sector*

Need Analysis of the program: The need for advanced skills in automotive systems technology and management is increasingly critical as the industry undergoes significant transformations. In India, the automotive sector is a major contributor to the economy, accounting for approximately **7.1% of the GDP** and employing **over 19 million people directly and indirectly**.[18] However, there is a substantial skills gap in areas essential for **modern automotive engineering**, such as **electric vehicles (EVs), autonomous driving, and smart mobility solutions**.[19]. Current projections indicate an annual growth rate of **8.2% for the automotive sector** from 2024 to 2029[20], driven by technological advancements and increasing consumer demand for innovative and sustainable vehicles.

[18] https://static.pib.gov.in

[19] The electric cars era transforming the car repairs and services landscape - Aiman Albatayneh, 2024

[20] www.mordorintelligence.com

Despite this growth, the talent pool with relevant skills remains limited, with many automotive firms reporting a gap in expertise related to new technologies.

Objective of the program: The main goal of this program is to cultivate a highly skilled workforce capable of spearheading **innovation and technological progress** in the automotive sector. By providing students with in-depth **knowledge and practical experience** in automotive systems technology and management, the program aims to develop leaders who can **design, oversee, and enhance automotive systems** using the latest technologies. This program addresses the industry's urgent need for expertise in **electric vehicles, autonomous driving, and smart mobility solutions**, supporting the broader objective of enhancing India's global competitiveness in the automotive industry.

Curriculum focus: The curriculum for the program is meticulously designed to provide a comprehensive education in both the technical and managerial aspects of the automotive industry. In the first trimester, students will build a solid foundation with modules on **Product Foundations and Process Foundations**. The second trimester focuses on advanced topics such as **Accelerated Product Development, Smart Manufacturing, and Electrification of Products**, equipping students with cutting-edge knowledge and skills. The third trimester allows for **specialization through electives** in specific fields and sustainability, ensuring students can tailor their education to their career goals.

Program outcomes: Graduates of this program will be well-equipped to take on various roles within the automotive industry, such as **Automotive Systems Engineer, Product Development Manager, and Sustainability Specialist**. They will possess a deep understanding of both the technical and managerial aspects of automotive systems, enabling them to **drive innovation and efficiency** in organizations such as **Maruti Suzuki, Eicher, Mahindra, MG Motors** etc. With a strong emphasis on sustainability and smart manufacturing, graduates will be prepared to lead the industry towards a more **sustainable and technologically advanced** future. Their hands-on experience through the capstone project will ensure they are ready to tackle real-world challenges and contribute significantly to their field.

6.4 Master in Semiconductor Manufacturing Technology and Management

- *The semiconductor market in India is expected to reach **$13.31 billion by 2029** with an annual growth rate **(CAGR) of 11.60%**.*
- *Curriculum includes **semiconductor devices, fabrication processes, and supply chain management, with a focus on thin-film deposition, MEMS, and understanding international economics.***
- *Prepares for careers in the semiconductor industry for roles like **Process Engineers and Production Managers** in **semiconductor companies**, **overseeing manufacturing***

processes, ensuring quality, and managing operations, advancing semiconductor production technology and efficiency.

Need Analysis of the Program: The semiconductor industry in India is experiencing significant growth, driven by **increasing demand for electronic devices, IoT, and AI integration**. In 2024, the semiconductor market in India is projected to reach **$7.69 billion**, with an annual growth rate **(CAGR) of 11.60%**, expected to reach **$13.31 billion** by 2029. The Indian government has set ambitious goals to establish the country as a global leader in semiconductor manufacturing, aiming to **achieve a domestic chip-making industry** valuation of $110 billion by 2030. This growth is supported by initiatives to reduce dependency on imports, which currently account for around **85% of India's semiconductor needs**. With a focus on building a **robust semiconductor ecosystem**, India is poised to significantly increase its share in the global semiconductor market.

Objective of the program: The program aims to prepare students for successful careers in the semiconductor industry by providing a comprehensive understanding of **semiconductor devices, fabrication processes, and industry standards**. This program equips students with the technical knowledge, practical skills and managerial skills needed to **design, manufacture, and manage the supply chain & operations** of semiconductor products. Key areas of focus include **thin-film deposition, Micro-Electro-Mechanical Systems (MEMS), and quality control**, moreover, the course has been designed to understand **international economics and the supply chain** of the semiconductor & its related products.

Program outcomes: Graduates of the program will be equipped with the technical expertise and management skills necessary to excel in the **semiconductor industry**. They will be prepared for roles such as **Process Engineers, Quality Assurance Specialists, Production Managers, and Semiconductor Fabrication Technicians**. Leading companies in the semiconductor sector, including **Intel, TSMC, and Applied Materials**, frequently offer such positions. These roles involve overseeing semiconductor **manufacturing processes**, ensuring **product quality**, and **managing production operations**, all critical to advancing the technology and efficiency of semiconductor production.

6.5 Master in Sustainable Engineering and Management

- *About **86% of** Indian companies now **recognize sustainability** as a core part of their strategy, but **only 16% have actively integrated sustainability goals** into their business models.*
- *The program readies students with interdisciplinary skills to tackle **environmental challenges, merge engineering, and economics, and promote sustainable practices and sustainability principles** for viable, eco-friendly solutions.*

- *Equipped for roles such as **Sustainability Consultants and Energy Managers** in leadership profiles across sectors like **environmental technology and public policy.***

Need Analysis of the program: There is a pressing need for sustainability studies as India continues to face environmental challenges, the need for climate-resilient infrastructure, and a shift towards sustainable business practices. About **86%** of Indian companies now **recognize sustainability** as a core part of their strategy, but **only 16% have actively integrated sustainability goals** into their business models.[21] The demand for '**green skills'** in India, including those needed for **renewable energy, electric vehicle technology and environmental governance** has surged. LinkedIn's 2024 Global Climate Talent Stocktake report highlights that while the **demand** for green skills has been **growing** at an average **rate of 5.9% per year** globally, the increase in skilled professionals has **lagged at 3.2%.**[22] By 2047, India is projected to **create 35 million green jobs**, yet existing educational and training programs are struggling to keep pace with the demand.[23]

Objective of the program: The objective of the program is to equip students with the interdisciplinary knowledge and skills necessary to address complex **environmental challenges**. This program integrates principles of **engineering, economics, and sustainability** to develop solutions that are technically sound, economically viable, and environmentally responsible. Students learn to **analyze and manage the impacts** of engineering projects on the environment, ensuring **sustainable development and resource management**. The curriculum often includes **hands-on projects, case studies, and collaboration with industry** experts to prepare graduates for leadership roles in various sectors, including **environmental technology, sustainable production, and public policy**.

Program outcomes: Graduates of the Sustainable Engineering and Management Program will be well-equipped to tackle **environmental challenges and drive sustainable practices** across various industries. They will possess a strong foundation in sustainability principles, engineering, and management, enabling them to **design and implement** effective solutions for sustainable development. Upon completion, students can pursue roles such as **Sustainability Consultants, Environmental Engineers, Energy Managers, and Sustainable Project Managers**. Companies like **Siemens, Schneider Electric, NTPC** etc. are known to offer job opportunities in this domain,

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[21] 16% of Indian organisations have prioritized sustainability goals: Study - BusinessToday

[22] economicgraph.linkedin.com/content/dam/me/economicgraph/en-us/PDF/linkedIn-global-climate-talent-stocktake-sept-2024.pdf

[23] Green pastures: Green jobs market awaits skilled talent amid ripe opportunities | YourStory

reflecting the growing demand for professionals skilled in sustainability and environmental management**.**

6.6 Master in Robotics Engineering and Management

- *India's Graduate Skill Index: 2023 report reveals only a **48% employability rate** among Indian graduates in AI and ML roles.*
- *Prepare students for the robotics industry by providing comprehensive knowledge in **designing, developing, and managing robotic systems** for manufacturing and hands-on training with robotic equipment.*
- *Take on roles like **Robotics Engineer and Design Engineer, support industries** in adopting robotics to improve efficiency and reduce costs, advancing automation initiatives for national economic growth.*

Need Analysis of the Program: According to the India STEM Foundation, **robotics education** in India is growing but remains **fragmented**, especially in terms of available resources, trained teachers, and infrastructure. Globally, women's participation in STEM fields lies at 28%. India's Graduate Skill Index: 2023 report reveals only a **48% employability rate** among Indian graduates in AI and ML roles.[24] Revenue is expected to show an annual growth rate **(CAGR 2024-2029) of 8.26%,** resulting in a market volume of **US $664.4 million by 2029**.[25] This poses a massive demand for skills in the robotics discipline.

Objective of the program: The objective of the program is to prepare students for successful careers in the **robotics industry** by providing a comprehensive understanding of **designing, developing, and managing robotic systems** tailored for **manufacturing, logistics**, and other sectors. The courses will give students a robust foundation in both **theory and application**. **Hands-on training** with robotic equipment will allow students to understand the intricacies of robotic **integration, troubleshooting, and maintenance**.

Program outcomes: Graduates of the program will be equipped with the technical expertise and management skills necessary to excel in the **robotics industry**. They will be prepared for roles such as **Product Engineer, Robotics Engineer, Machine Learning Specialist, Robotics Machine Operator, Design Engineer** etc. Leading companies in the sector, including **Micron, ABB, Siemens** etc. frequently offer such positions. The expertise gained will position graduates as leaders in the **automation revolution**. They will be qualified to support industries in adopting **robotic systems** that improve **efficiency, reduce labour costs, and minimize human error**. These graduates

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[24] Mercer_Mettl_Indias_Graduate_Skill_Index_2023.pdf

[25] Robotics - India | Statista Market Forecast

will be instrumental in managing and advancing automation initiatives that align with the nation’s economic and technological growth aspirations.

7. Strategic Vision: 15-year strategic plan

This section highlights the summary of the 15-year strategic plan of the proposed Deemed-to-be University in the areas of academics; collaborations; applied research; information and communication; infrastructure development; faculty and staff recruitment; student admissions; and financial management and goals. Further, the proposed Deemed-to-be University will comply with all the rules and regulations for establishing the said institution given by UGC and AICTE in terms of policies, governance, administration, financial requirement, infrastructure development, and admissions etc.

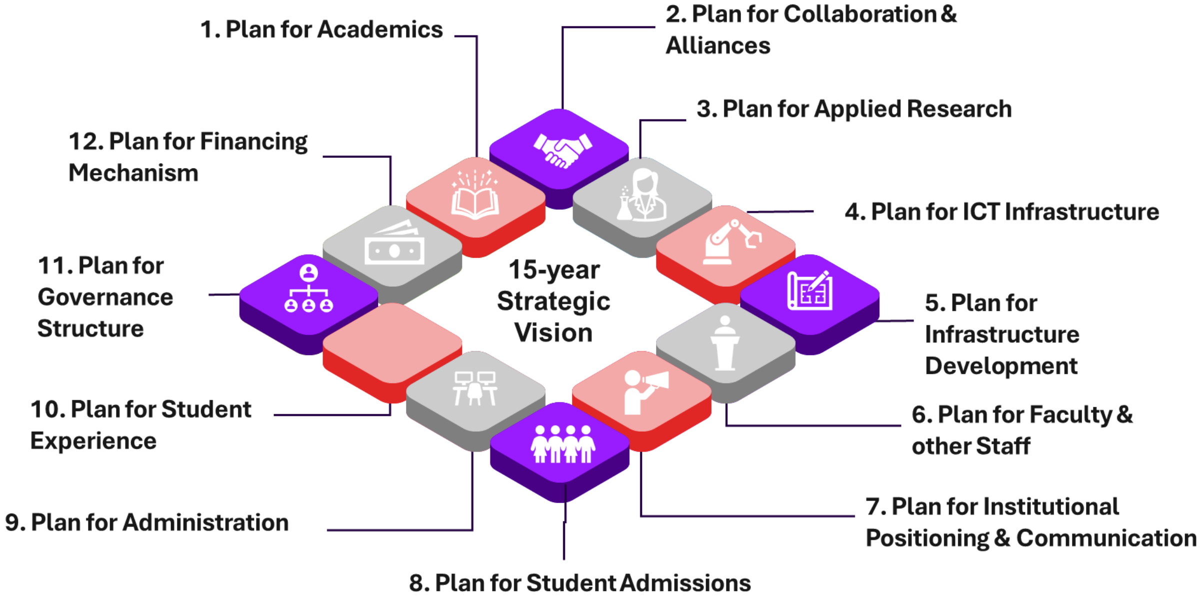

Figure 9 : Components of 15 Year strategic plan

Plan for academics:

- The proposed Deemed-to-be University will **align its curriculum with industry need**s, emphasizing **hands-on learning**, **innovative experiential methods**, and **emerging technologies**. By leveraging **international expertise and integrating Phygital learning**, the university aims to prepare students for a global, technology-driven economy.
- The proposed Deemed-to-be University will launch **five unique programs across four schools** in the first year of its operations. The aim is to continue to **launch more unique programs** across the said schools depending upon the **new, upcoming, and disruptive trends in engineering, technology, and management.**
- The proposed **two-year master's program**, **aligned with NEP 2020**, offers **multiple entry, and exit points** in form of pathways: Industry, International, Online, and Entrepreneurial. It **targets recent B.E./B.Tech. graduates**, with the **first year being residential and the second year offering flexible online options**.

- The proposed Deemed-to-be University will adopt techniques such as **flipped classrooms, state-of-the-art laboratories, capstone projects, and industry-centered learning** will be employed to create an **immersive educational experience**.
- The **curriculum will be developed in collaboration with leading industry players and global academic institutions** to ensure rigor and relevance.
- **Learning outcome measurement** at the proposed Deemed-to-be University will use robust **evaluation frameworks to assess skill acquisition, critical thinking, and knowledge application**. This data-driven approach ensures students achieve both academic benchmarks and practical competencies, preparing them for successful careers.

<u>Plan for collaboration and alliances:</u>

- The proposed Deemed-to-be University will categorize its **academic partnerships into five key areas: Curriculum Development, Infrastructure, Research and Development, Faculty, and Student**.
- The proposed Deemed-to-be University believes that **industry partnerships** are fundamental to the success and is excited to **establish a range of partnerships divided into four categories - Flagship Partnership, Strategic Partnership, Social Impact Partnership, and Other Partnerships** which will take the academic excellence and infrastructure growth to the next level

<u>Plan for applied research:</u>

- The proposed deemed-to-be university aims to conduct research that transforms into **tangible innovative outcomes** by adopting the **Technology Readiness Levels framework** utilized by NASA.
- The proposed deemed-to-be university will focus on actively engaging with industries by establishing a **research park** that aims to **host at least 50 reputable industries**.
- The proposed deemed-to-be university also aims to **promote entrepreneurship and innovation** by providing space for startups and **facilitating technology transfer for commercialization.**

<u>Plan for Information and Communication Technology (ICT) infrastructure:</u>

- The proposed deemed-to-be- University's **ICT strategy focuses on accessibility at scale and integrating smart technology** to deliver quality education, operational efficiency, and sustainability.

- Establish a **smart campus with AR/VR labs, cyber-physical systems, and smart classrooms, supported by cloud-based LMS, SIS, ERP systems, AI-enabled security, and comprehensive Wi-Fi for IoT integration**.

Plan for infrastructure:

- The main campus for the proposed Deemed-to-be University will be developed over a period of 15 years. There is a**pproximately 150 acres of land available for this extensive project**.
- In the first phase, **development will focus on around 30 acres, with approximately 1 million square feet of construction planned over a 3 - 5 years period**. This initial phase will feature state-of-the-art technology-enabled classrooms, workshops, high-tech laboratories, a library, computer labs, an auditorium, residential facilities, and other essential amenities to support a comprehensive educational environment.
- The campus of the proposed Deemed-to-be University's area will be used for **academic and instructional activities; admin roles; recreational activities; accommodation; and a research park.**

Plan for faculty and other staff recruitment:

- The proposed Deemed-to-be University will have a **faculty cadre mix of Professors, Associate Professors, and Assistant Professors in a 1:2:6 ratio**, aiming for a **1:14 faculty-student ratio within the first five years.**
- **Instructors and Mentors will provide practical learning for digital programs**, while **visiting and international faculty** will offer industry and academic expertise.
- Faculty recruitment will **focus on hiring from top institutions, industries, and global organizations, ensuring compliance with UGC regulations, and emphasizing diversity**.
- The university will **collaborate with global MNCs, Indian firms, and top academic institutes for curriculum design and teaching, enhancing industry alignment and international exposure**

Plan for institutional positioning and communication:

- The proposed Deemed-to-be University aims to establish **a differentiated positioning to attract students, faculty, and partnerships, enhance academic and employer reputation, and promote international recognition.**

- The strategy includes **establishing a strong foundation in the first 5 years with brand identity and community engagement**, **strengthening the positioning** in the next 5 years **with targeted campaigns and partnerships, and elevating the positioning** in the final 5 years to **achieve global leadership and recognition**.

Plan for student admission:

- The admissions process will **focus on academic achievement, fairness, inclusivity, diversity, and holistic evaluation**, with clear **eligibility criteria (B.E./B.Tech) and entrance exams like GATE, GRE, or the proposed Deemed-to-be University's own test**.
- Various scholarships will be offered, including **merit-based, merit-cum-means, and specific scholarships for women in manufacturing, with 10% of fee revenue set aside for financial aid by year 7.**
- A student-friendly process with **online applications, yield management, waitlists, orientation programs, and support for international students.**
- Strategies to **attract diverse students, provide merit-based scholarships, conduct sensitization training, and foster an inclusive campus culture** with various support committees.

Plan for administration:

- The proposed Deemed-to-be University will **establish a comprehensive Quality Assurance System (QAS) and an Internal Quality Assurance Cell (IQAC)** to ensure high-quality teaching, research, and continuous improvement, aiming for national and international excellence.
- Emphasis on **holistic learning engineering to bridge gaps between theory, research, and practical application**, using data-driven instructional design to enhance learning outcomes.
- A **robust feedback system involving students, alumni, faculty, employers, and parents** will be implemented to enhance educational quality and align with industry needs.
- It will **pursue prestigious national and international accreditations and rankings to standardize curriculum, assure high-quality education, and gain worldwide recognitio**n, thereby improving its reputation and standing in the academic and industry communities.
- The proposed Deemed-to-be University will have **International Advisory Board, Research & Innovation Advisory Board, and Industry Advisory Board.**

<u>Plan for Student Experience:</u>

- The proposed Deemed-to-be University aims to provide comprehensive support throughout the **student journey, from application to alumni, ensuring a seamless academic, social, and personal experience** with services like **accommodation, health, and career development.**
- It will foster a **holistic learning environment with career services, diverse events, and student-run clubs**, while evolving over time to meet student needs and maintain high service standards through strategic enhancements and sustainability efforts.
- The aim of alumni engagement is to cultivate a symbiotic relationship wherein the alumni feel valued, stay connected, and contribute to the proposed Deemed-to-be University's evolving growth narrative. Hence, there will be an **alumni engagement cell** for this purpose.

<u>Plan for governance structure:</u>

- The proposed Deemed-to-be University will e**nsure transparent, effective, and responsible governance, developing policies for transparency, fairness, ethics, and regulatory compliance.**
- The organizational structure will be designed for quick decision-making, aligned with policies and quality processes, and will include **officers such as the Chancellor, Vice Chancellor, and others.** The appointment of officers will be as per UGC Deemed-to-be University Regulation 2023.
- **It will also have authorities such as the Executive Council, Academic Council, Finance Committee, Board of Studies, and Selection Committee,** as defined by UGC Deemed-to-be University Regulation 2023

<u>Plan for financing mechanism:</u>

- The proposed deemed-to-be University plans to have **diversified revenue streams**, tuition fees, sponsored research, and interest from the corpus fund, ensuring a balanced and resilient financial structure.
- The **expected year-on-year student growth rate is approximately 70% until Year 5, around 25% from Year 5 to Year 10, and about 10% from Year 10 to Year 15**.
- At steady state, the intake is projected to be **9,000 students for the Masters Program, 300 students for the International Professional Technologists Program, and 150 students for the PhD Program.**

- Total capital expenditure over the **first 5 years is estimated to be around INR 750 Cr**, with major investments in infrastructure development, lab equipment, and digital infrastructure.
- The proposed deemed-to-be University will prioritize **strategic investments** in infrastructure, faculty, and student support services to achieve academic and research goals while maintaining fiscal prudence.
- The financial strategy will support not only academic programs and infrastructure development but also the commitment to **student accessibility** and **quality education**.

In conclusion, the 15-year strategic plan for the proposed Deemed-to-be University sets a comprehensive roadmap for growth and excellence across multiple domains. By focusing on academics, collaborations, applied research, information and communication, infrastructure development, faculty and staff recruitment, student admissions, and financial management, it aims to establish itself as a leader in higher education. The following sections will delve into each of these areas in greater detail, outlining specific strategies and initiatives designed to achieve these ambitious goals.

7.1 Plan for Academics

This section outlines the comprehensive academic plan for the proposed Deemed-to-be University, detailing all aspects of curricular design, delivery, assessment, and outcomes within the teaching-learning process. As the foundation of the educational experience, this plan articulates the academic philosophy, the structure of schools and centers, the salient features of program offerings, and the pedagogical and curricular approaches. Additionally, this section also includes a detailed program rollout plan, emphasizing the integration of the proposed Deemed-to-be University's academic philosophy.

NAMTECH launched its first program in September 2023 – the International Professional master's Program (iPMP) in Smart Manufacturing - a 1-year residential accelerated master's program that prepares engineering graduates (BE/BTech graduates) to become world-class engineers with high-end management skills. The iPMP was offered in partnership with Technical University of Munich (TUM). Part of the program was delivered in Singapore at the TUM Asia Singapore Campus.

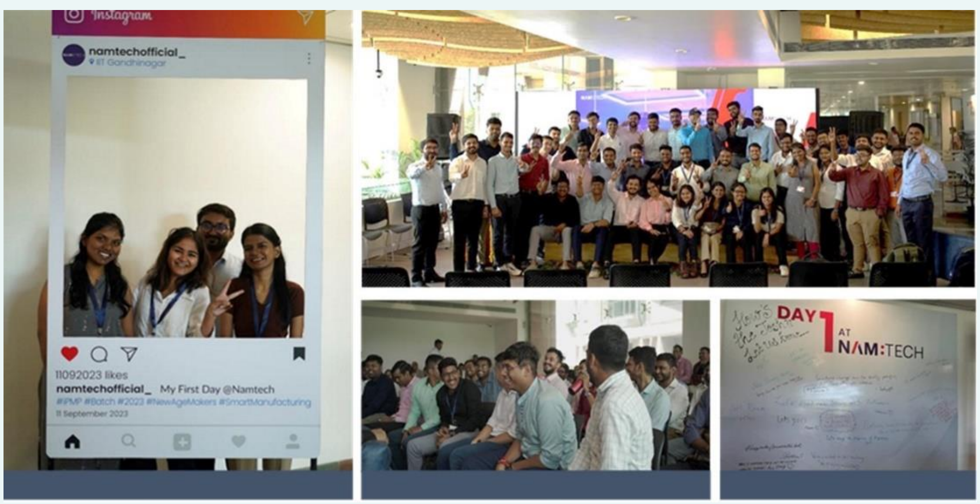

Figure 10 : iPMP inaugural cohort, batch of 23-24

The first batch of iPMP has 54 students with 8 females. 41% of the students have prior work experience across diverse sectors. NAMTECH worked with global faculty [from US, Europe, Germany, Singapore] for delivering iPMP modules to NAMTECH students A total of 25 global faculty members delivered modules to iPMP Students.

Figure 11 : Classes for iPMP students

7.1.1 Academic Philosophy

The academic philosophy of the proposed Deemed-to-be University's centers on integrating the dynamic nature of industry with academic rigor to develop an industry-ready workforce. The academic philosophy comprises of the following elements:

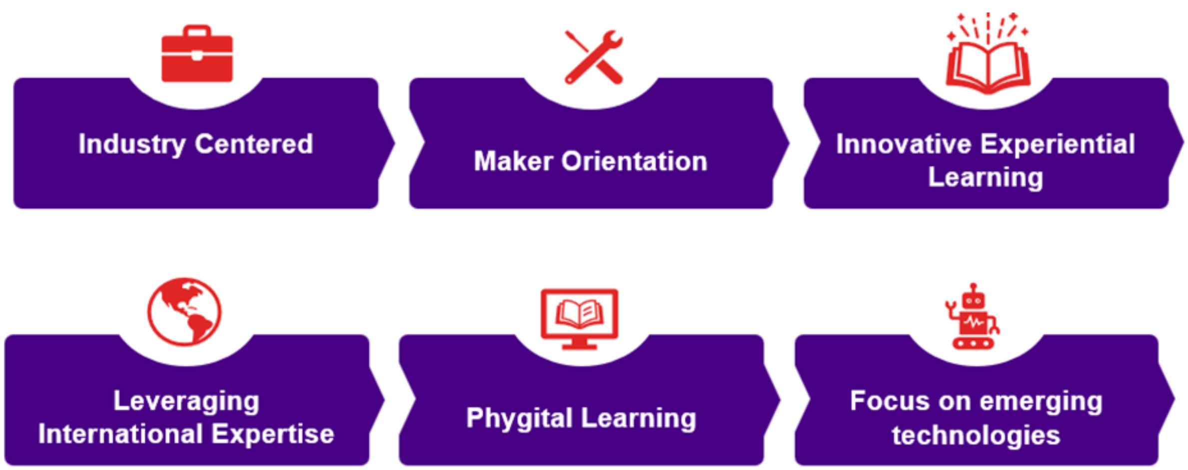

Figure 12 : Features of Academic Philosophy

1. **Industry-centered** programs focus on alignment with industry needs. This ensures the curriculum reflects current job trends. Partnering with industry leaders will equip students with essential skills for a smooth transition into the professional world.
2. **Maker Orientation**: The maker orientation encourages a hands-on learning environment and creativity, allowing students to design and innovate through practical projects. This approach enhances critical thinking and problem-solving skills, allowing the students to apply their theoretical knowledge in real-world situations. Labs and

maker spaces at the proposed Deemed-to-be University will be one of the key elements in fostering experimentation and collaboration.

3. **Innovative Experiential Learning** emphasizes learning through experience. Innovative methods like project-based learning, capstone projects with industry, internships, and live case studies will be embedded into the program structure. By engaging with real-world problems, students learn to apply their knowledge and skills to solve complex problems, develop critical thinking and problem-solving abilities, and engage with team members.
4. **Leveraging International Expertise** by actively integrating global perspectives into the educational framework. Collaborating with international academic and industrial organizations the proposed Deemed-to-be University aims to equip students with diverse ideas and practices, preparing them to excel in an interconnected global economy.
5. **Phygital Learning** combines physical and digital experiences to enhance education. By using technology alongside traditional methods, it makes learning more accessible and interactive. Students will utilize digital tools, virtual simulations and flipped classroom approach which can accommodate diverse learning styles while preparing them for technology-driven workplaces.
6. **Focus on Emerging Technologies** in the curriculum like AI, data analytics, IIoT, AR, VR, and digital twin. Knowledge of these technologies approach will equip the students with essential skills of the future and foster a mindset focused on innovation and continuous learning for future success. Further, emerging trends will be continuously monitored and integrated with the curriculum relevant at specific times.

7.1.2 Academic Structure

The academic structure of the proposed Deemed-to-be University is systematically organized into a diverse array of schools and centers, each dedicated to advancing knowledge and fostering innovation within specific academic domains. The schools encompass a broad spectrum of unique disciplines, to ensure a holistic, robust, and interdisciplinary educational experience. The schools are complemented by research and innovation cell, which will be at the forefront of applied research and collaborative initiatives.

Additionally, there will a Center for Meta Skills. The schools and centers together will create a dynamic and supportive environment that nurtures intellectual growth, encourages critical thinking, and prepare students to become leaders and innovators in their respective fields.

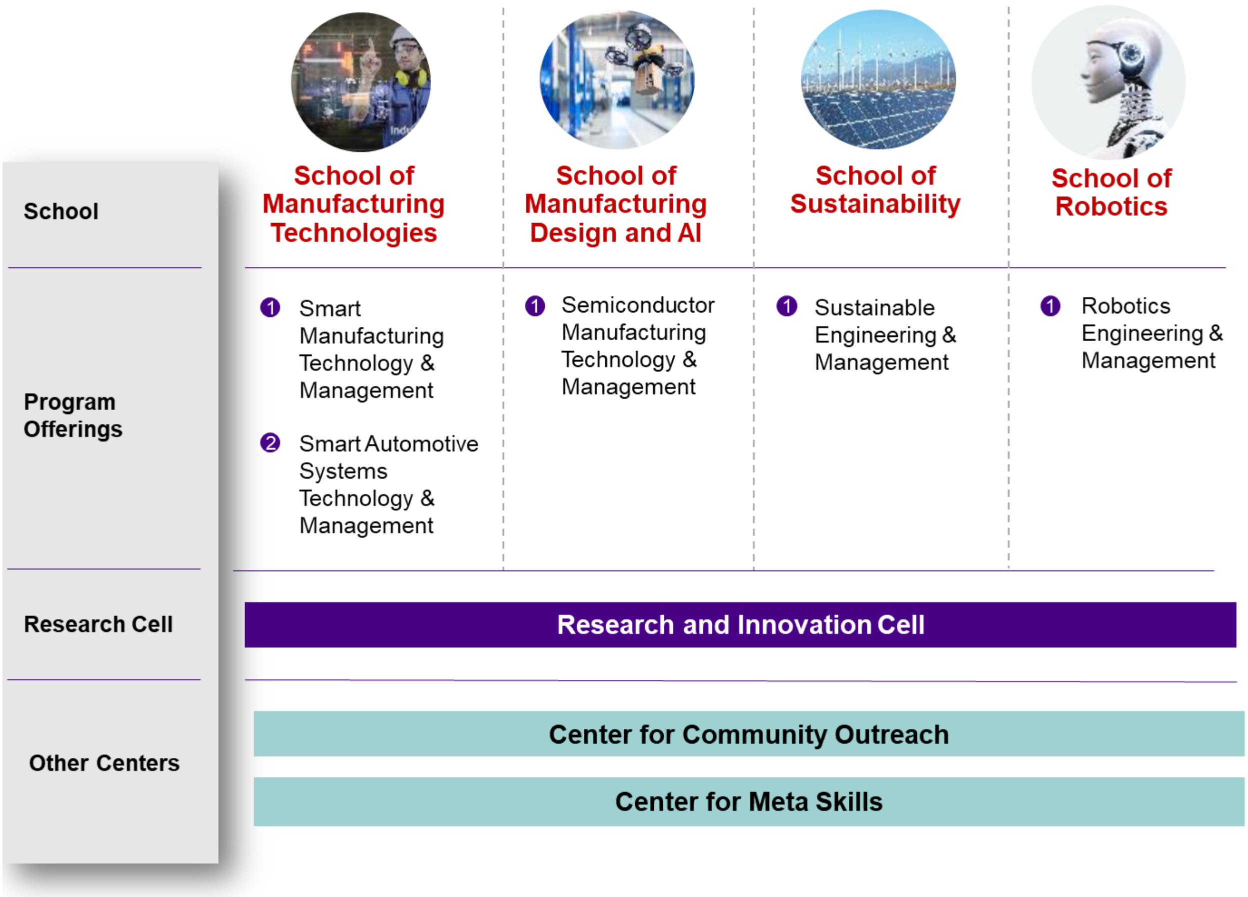

Figure 13 : Academic Structure

1. <u>School of Manufacturing Technologies</u>

Description: The School of Manufacturing Technologies will be established with a focus on creating experts in the rapidly evolving fields of Smart Manufacturing and Automotive Systems. As industries increasingly adopt digital solutions to enhance production efficiency and quality, this school will provide in-depth knowledge of advanced manufacturing technologies and management. Courses cover indicative areas such as Industrial IoT, data analytics, automation, project management etc. equipping students to handle high-tech manufacturing environments.

Impact

Graduates from this school will not only have strong technical and managerial knowledge of manufacturing processes but will also understand how to leverage digital technologies for enhanced productivity and innovation. This makes them ideal for roles in high-demand fields such as industrial automation, predictive maintenance, and digital manufacturing transformation. The school's focus on smart technologies is aligned with India's mission to become a global manufacturing leader, preparing students to contribute to high-quality, scalable production that meets both local and international demands

2. School of Manufacturing Design and AI

Description: The School of Manufacturing Design and AI will focus on bridging the gap between traditional manufacturing design and the latest advancements in artificial intelligence. One of the programs will be Semiconductor Manufacturing Technology and Management, addressing the critical need for secure, data-driven, and innovative design in manufacturing. Semiconductor Manufacturing courses will emphasize precision and miniaturization technologies critical for electronics and digital devices.

Impact

Graduates from this school will bring to the workforce a combination of technical, management, design acumen and digital intelligence. They will be prepared to work on cutting-edge semiconductor projects, secure manufacturing networks from cyber threats, and apply AI-driven approaches to innovate manufacturing processes. Their expertise will be crucial for companies looking to maintain competitive edges in quality, efficiency, and security in production, making them valuable assets in a high-tech global market.

3. School of Sustainability

Description: The School of Sustainability will be designed to instill a deep understanding of environmental conservation, resource management, and sustainable practices. Offering program centered on Sustainable Engineering and Management in Industrial Practices, the school will cover sustainable energy solutions, circular economy principles, waste minimization, and renewable resource utilization. The curriculum will emphasize on the practical approaches to reducing environmental impact in industries, from minimizing carbon emissions to adopting eco-friendly manufacturing processes. Students will also learn about environmental policy, regulatory standards, and the role of technology in achieving sustainability goals.

Impact

As India pursues its environmental and sustainability goals, graduates from this school will be instrumental in driving green practices across industries. They will be equipped to design, implement, and manage sustainable solutions that align with Corporate Social Responsibility (CSR) and Environmental, Social, and Governance (ESG) frameworks. These professionals will play a key role in helping industries transition to sustainable operations, reduce ecological footprints, and meet both national and international standards for environmental responsibility.

4. School of Robotics

Description: The School of Robotics will focus on the interdisciplinary study and application of robotics technology. Robotics involves the design, construction, and operation of robots, which are machines capable of performing tasks autonomously or semi-autonomously. This field combines elements of mechanical engineering, electrical engineering, computer science, and artificial intelligence to create systems that can interact with their environment and perform complex tasks. The programs offered will prepare students to design, develop, and manage robotic systems tailored for manufacturing, logistics, and other sectors. Indicative courses will cover robotic kinematics, dynamics, control systems, human-robot interaction, and AI in robotics, giving students a robust foundation in both theory and application. Hands-on training with robotic equipment will allow students to understand the intricacies of robotic integration, troubleshooting, and maintenance.

Impact

The expertise gained will position graduates as leaders in the automation revolution. They will be qualified to support industries in adopting robotic systems that improve efficiency, reduce labor costs, and minimize human error. As India's industries increasingly embrace robotics to enhance productivity, these graduates will be instrumental in managing and advancing automation initiatives that align with the nation's economic and technological growth aspirations.

5. Research and Innovation Cell

Demand and Need: The demand and need for research and innovation cells in India is driven by the country's ambition to become a global leader in technology and related fields. India's technology sector alone has faced a demand-supply gap of ~ 21% underscoring the need for targeted research and innovation initiatives to bolster digital skills and innovation capacity.[26]

Description: This cell will serve as a hub for pioneering research and development, with an emphasis on creating industry-ready solutions and fostering academic excellence. By promoting interdisciplinary projects across fields like AI, robotics, and sustainability, it will encourage students and faculty to engage in impactful research that addresses real-world challenges. The Research and Innovation Cell will aim to build partnerships with industries and other academic institutions, facilitating knowledge exchange and collaboration.

[26] India's Tech Industry Talent: Demand-Supply Analysis | nasscom

Impact

The Research and Innovation Cell will drive the innovation ecosystem, contributing to the development of novel technologies and methodologies. By bridging academic research with industry needs, this cell will generate intellectual property, enhance student learning, and support India's ambition of becoming a leader in technological innovation.

6. Other Centers

A. Center for Community Outreach

Demand and Need: India is poised to become the world's third-largest economy with a GDP of $5 trillion in the next three years, aiming for $7 trillion in six to seven years and developed country status by 2047. Despite its large working-age population and growth potential, challenges like unemployment and the need for skilled workers persist. By 2025, 97 million new jobs [27]will require future-oriented skills, driven by trends like digital connectivity and AI. However, only 48% of ITI seats are utilized[28], with high drop-out rates and low placement success, highlighting a critical skill gap. To meet its economic ambitions, India must reform its skill development ecosystem, particularly ITIs, to ensure youth are adequately skilled, placed, and motivated for careers in manufacturing and other sectors.

Description: The Center for Community Outreach will be established to focus on empowering communities through skill-based technical education. With Centers for advanced Technical and Vocational Education and Training (TVET) and Industrial Training Institutes (ITIs) Outreach, the school will target certified technicians and diploma holders, offering advanced training programs that enhances their employability and technical skills. The curriculum will span across areas such as industrial maintenance, safety standards, digital literacy, and hands-on skills for various trades. ITI Outreach will provide support to Industrial Training Institutes (ITIs) to bridge skill gaps in vocational education, ensuring equitable access to quality training.

[27] India's turning point - An economic agenda to spur growth and jobs August 2020 – McKinsey Global Institute

[28] Transforming ITIs – a report by NITI Aayog, 2023

Impact

This center will play a significant role in uplifting underprivileged communities by providing practical skills that lead directly to employment opportunities. By equipping technicians and diploma holders with industry-relevant skills, the School for Social Impact contributes to the creation of a skilled workforce capable of supporting India's growing industries. It also addresses critical skill shortages in the technical workforce, fostering socio-economic development by enhancing employability and promoting inclusive growth.

B. Center for Meta Skills

Demand and Need: The demand for meta skills – skills that support adaptability, complex problem-solving, and cognitive flexibility – is rising sharply in India. A NASSCOM report projects that by 2028, the digital talent gap in India will grow to 28-29% due to increasing demand for complex skills which include meta skills such as critical thinking and creativity.[29]

Description: This center will focus on the development of essential skills such as critical thinking, problem-solving, teamwork, and communication. The Center for Meta Skills will offer modules for program offerings, workshops, seminars, and practical training sessions aimed at fostering these transferrable skills, which are crucial in a rapidly changing work environment.

Impact

The Center for Meta Skills will enable students across all the proposed schools to excel in various professional and interpersonal settings. By promoting soft skills and cognitive flexibility, this center will prepare graduates to adapt to complex work environments, enhancing their employability and capacity for leadership

This center will help students across the school to develop the above-mentioned skillset. This will help in instilling values of sustainability, innovation, and social responsibility across all the schools of the proposed university. Through its specialized schools and centers, the proposed Deemed-to-be University will produce graduates who are not only technically skilled but also equipped with critical thinking, adaptability, and ethical awareness. This structure directly supports India's goals of developing a skilled workforce, driving economic growth,

[29] India Tech Industry Digital Talent Demand and Supply 2023 | nasscom

and achieving sustainability, positioning the proposed Deemed-to-be University as a catalyst for national development and global competitiveness.

7.1.3 Pedagogy & Curriculum Design

At the proposed Deemed-to-be University the aim will be to foster an environment that encourages critical thinking, creativity, and lifelong learning. The curriculum will be meticulously crafted with anchor industry and global academic partners to integrate contemporary educational theories with practical applications, ensuring that students are not only well-versed in their chosen fields but also equipped with the skills necessary to navigate and excel in a dynamic global economy. By embracing a student-centered approach and leveraging cutting-edge technology, the aim is to create a transformative educational experience that prepares the graduates to be leaders and innovators in their respective domains.

Pedagogy

The pedagogical approach is designed to foster an environment of active learning, critical thinking, and real-world application. The proposed Deemed-to-be University embraces new age practices that move beyond the traditional lectures and provide a more immersive and dynamic learning experience.

- **Flipped classroom:** Emphasizing pre-class preparation, flipped classroom method will encourage the students to engage with foundational material ahead of time, transforming classroom sessions into interactive spaces for analysis, discussion, and hands on learning. This model shifts the focus to student led learning, enhancing the engagement and comprehension.
- **State of the art Laboratories:** The labs will integrate advanced technologies that mirror industry standards, replicate real world manufacturing and industrial settings, allowing students to gain practical experience in a controlled yet realistic environment. This hands-on exposure to complex systems and workflows will provide invaluable experience, preparing them for seamless transitions into the professional world.
- **Capstone Projects:** As part of the curriculum, students will undertake capstone projects with industry partners that integrate theoretical knowledge with practical applications, solving real-world industry problems. These projects encourage collaboration, innovation, and problem-solving skills, while also allowing students to showcase their expertise to potential employers.
- **Maker Mindset:** The proposed Deemed-to-be University aims to instill a maker mindset in students, encouraging them to explore, experiment and build solutions through practical work. This hands-on approach to learning reinforces their technical,

functional, and behavioral skills, empowering them to be creators rather than passive learners.

- **Industry Centered Learning:** Through close partnerships with leading industry players, the aim is to create an environment that reflects closes the gap with academia. To achieve this, experts from the industry will be called into the classroom and facilitating regular interactions in forms of workshops, internships, and capstone projects.
- **Experiential Learning** will be core component of the educational experience. By engaging students in real world simulations, case studies, capstone projects, internships, and workshops, the aim is to provide them with opportunities to directly apply classroom concepts, ensuring that they are competent, and their learning is grounded in real world application.

Curriculum Design

The curriculum will be meticulously crafted in collaboration with anchor partners i.e., leading industry players and eminent global academic institutions. This will ensure that the program offerings are rigorous, relevant, and aligned with the highest global standards. It will combine the foundational knowledge with functional and meta skills, empowering the students to excel in rapidly evolving fields.

Indicated below is the curriculum design methodology:

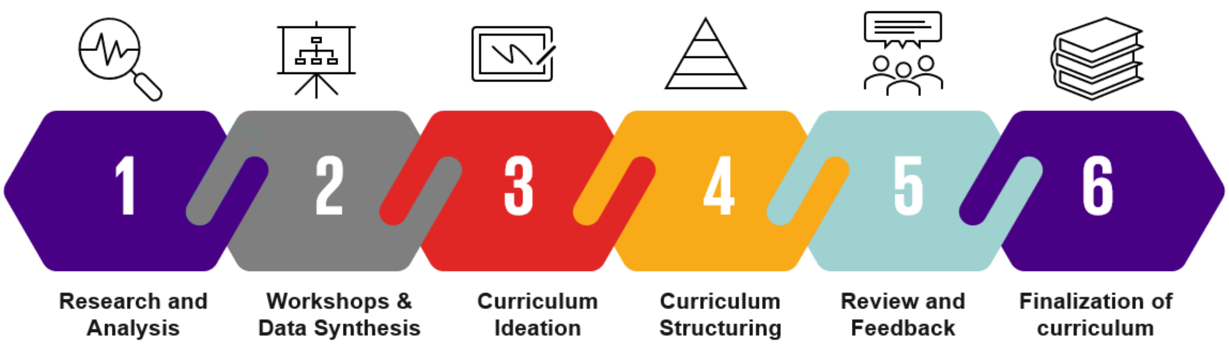

Figure 14 : Methodology for curriculum design

1) **Research and Analysis:** The identified anchor industry and academic partner alongside proposed Deemed-to-be University's academic team will identify high-demand focus domains by conducting preliminary market research. Further, the determined gaps within current educational offerings and the employment pathways will be assessed to determine priority areas.
2) **Workshops and Data Synthesis:** The team will organize workshop(s) with leading industry experts of the identified domain to discuss research findings,

validate skill needs, and identify emerging trends. A report will be prepared with the outcome and insights captured during the workshop(s).

3) **Curriculum Ideation:** Upon completion of the data synthesis and consultation with leading industry partners, the report prepared will be shared with the anchor global academic partner. The global academic partner and their team will review the outcomes and industry insights to integrate into the curriculum for the selected program offering and align it with the academic philosophy and features.

4) **Curriculum Structuring:** The global academic partner and their team along with the academic team will apply the Bloom's Taxonomy[30] to create a structured curriculum that nurtures critical thinking and practical application, progressing from foundational knowledge to advanced skill sets. Next the learning outcomes, pedagogy and assessment matrix will be drafted.

5) **Review and Feedback:** The curriculum drafted by the anchor global academic partner and the academic team will share it with the anchor industry partner to capture their feedback and ensure alignment with current industry standards.

6) **Finalization of curriculum:** Upon completion of the incorporation of the feedback from industry, final revisions will be made to ensure the draft curriculum meets global academic and industry benchmarks. The finalized draft of curriculum will then be shared with The Board of Studies and The Academic Council for their feedback and inputs. They will finalize the draft and share it with the executive council for approval to launch.

In conclusion, the proposed Deemed-to-be University's commitment to innovative pedagogy and dynamic curriculum design is at the heart of the academic philosophy. By continuously adapting to the latest advancements in education and industry, it will strive to provide the students with a holistic and forward-thinking learning experience.

[30] Bloom's Taxonomy is a hierarchical classification of the different levels of thinking and should be applied when creating course objectives. Course objectives are brief statements that describe what students will be expected to learn by the end of the course. The full power of learning objectives is realized when the learning objectives are explicitly stated.

7.1.4 Salient Features of Academic Offering

The academic program at the proposed Deemed-to-be University will be designed to set new standards in higher education, blending industry relevance with its pedagogy. The offering will emphasize experiential learning, adaptability, and rigorous assessment, preparing students not only with knowledge but also with the skills and adaptability required in today's rapidly evolving industries.

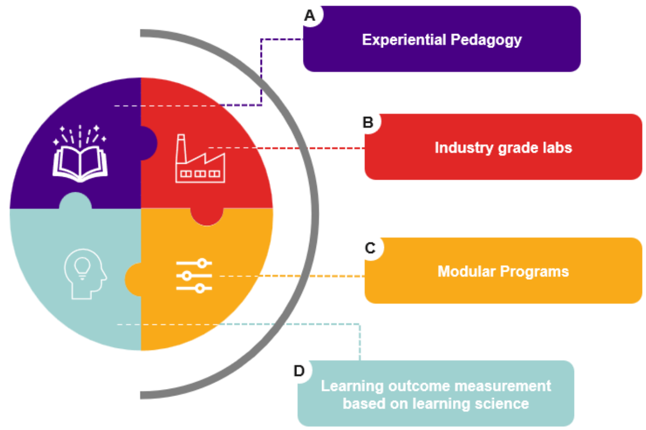

Figure 15 : Salient Features of Academic Offerings

1. **Experiential pedagogy** used in the academic program ensures students engage actively with concepts and applications beyond traditional classroom boundaries. Through project-based assignments, case studies, capstone projects, internships, and industry partnerships, students gain first-hand experience that sharpens problem-solving skills and promotes critical thinking. This approach cultivates independent learning and practical expertise, equipping students to tackle real-world challenges with confidence and competence.
2. **The State-of-the-art Industry-grade labs** will feature advanced tools and technologies and mimic the environment of real-world factories. These labs are designed to mimic the workflows, processes, and conditions found in industry settings, offering students an immersive, hands-on experience in a simulated factory environment. This approach allows students to develop practical skills from understanding complex machinery operations to managing production workflows. Regular upgrades to these facilities will ensure that the facilities stay at the forefront, fostering an environment of innovation and experimentation. By offering a high level of realistic industry exposure, the proposed Deemed-to-be University bridges the gap between academic learning and professional practice, equipping the students with the practical expertise needed to excel in their careers from the very beginning.
3. **Modular program structure** allows students to tailor their academic pathways according to their interests and professional goals, a need recognized by the diverse academic and career aspirations of the students. The flexibility supports personal growth allowing students to build their unique portfolio of knowledge and skills. By supporting continuous learning and progression, the students are empowered to remain relevant in an era of rapid innovation.
4. **Learning outcome measurement based on learning science** emphasizes on assessing and measuring learning outcomes. It employs robust evaluation

frameworks that extend beyond conventional grading, incorporating methods that assess skill acquisition, critical thinking, and knowledge application. By using data-driven insights and evidence-based practices, the proposed Deemed-to-be University ensures that the students not only meet academic benchmarks but also achieve mastery in practical competencies. This commitment to effective learning outcomes drives both teaching quality and student success, ensuring that the graduates are well-prepared for the demands of their careers.

In addition to the above features, the academic program will also have component of **Global Immersion** integrated in it. This component will be offered to students in the first year of their academic program and will be optional to opt for. This component is designed to broaden students' perspectives and equip them with insights from leading international education systems and industry practices. Through curated experiences across partner institutions, students will engage directly with diverse academic and cultural settings, providing a unique vantage point on emerging global trends and innovations. This approach will not only enhance cross cultural competencies but also foster a deeper understanding of international markets and operational ecosystems, preparing the students to navigate globally.

7.1.5 Program Offerings

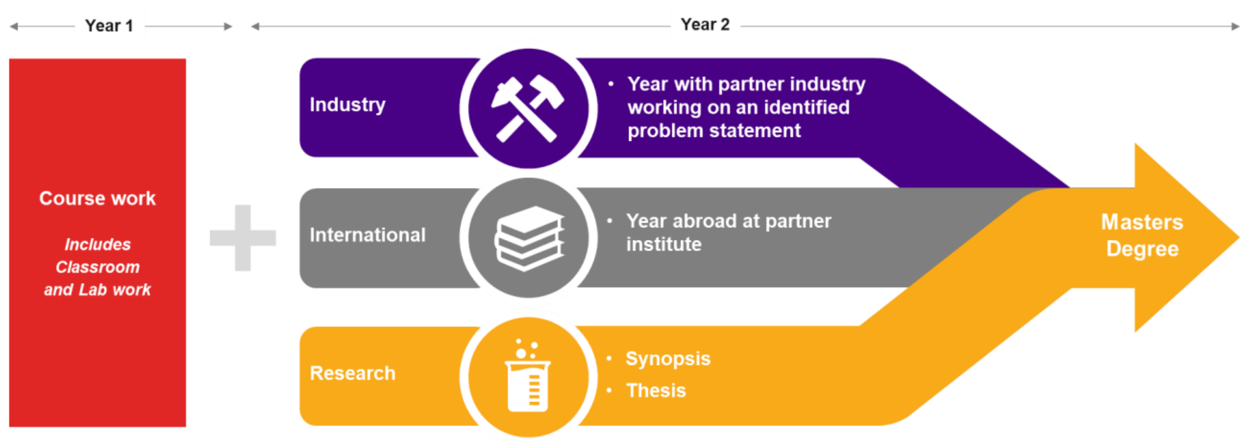

Figure 16 : Program Offering

The proposed Deemed-to-be University's innovative two-year master's program consists of three pathways, each sharing a common one-year component worth 40 credits, has been meticulously designed to align with the evolving needs of students, industry, and academia. It provides a blend of rigorous coursework and flexible pathways, ensuring graduates are equipped with advanced knowledge, practical skills, and global perspectives. The program structure is as follows:

Year 1: Foundation Through Coursework

The first year will be residential and serve as the cornerstone of the program. Students will immerse themselves in intensive classroom and laboratory-based learning, focusing on advanced concepts and practical applications in their chosen domain. The residential format will ensure a conducive environment for collaborative learning, hands-on experiences, and access to cutting-edge infrastructure.

Year 2: Tailored Pathways for Specialized Learning

The second year of the program is designed to provide students with tailored experiences aligned with their career goals and interests. By offering three distinct pathways, the program ensures that students gain expertise in their chosen area, whether it's industry engagement, international exposure, or research-driven learning. Each pathway is structured to maximize learning outcomes through a blend of theoretical and practical engagements, ensuring that graduates are well-prepared for the demands of their respective fields.

Pathway 1: Industry Engagement and Capstone Project

This pathway focuses on bridging the gap between academia and industry by immersing students in real-world challenges. It is designed to cultivate problem-solving skills, industry insights, and professional experience.

Key Highlights:

A. **Industry Problem Identification:** In collaboration with industry partners, students identify a relevant and impactful problem statement. This problem typically addresses current challenges faced by organizations or emerging trends in the field.

B. **Planning and Hypothesis Development:** Students develop a structured plan to address the identified problem, which includes Formulating a hypothesis or project objectives, designing a solution framework with a clear methodology, establishing metrics for evaluating the success of their approach etc.

C. **Implementation in the Industry:** Students transition from planning to execution by working directly within the industry environment. During this phase, they implement their solutions, gather data, and refine their approach based on real-time feedback.

D. **Mentorship and Evaluation:** Students receive guidance from industry mentors and faculty advisors, ensuring they remain aligned with professional standards and project goals. The final evaluation is based on the impact, feasibility, and innovative aspects of their solutions.

This pathway prepares students to thrive in professional roles, equipping them with industry-ready skills and a network of corporate contacts.

Pathway 2: International Mobility

The international mobility pathway is designed for students aspiring to gain global exposure and broaden their academic and cultural horizons. It facilitates a seamless transition to study at partner institutions abroad.

Key Highlights:

A. **Partnership with Leading Global Universities:** The proposed Deemed-to-be University will collaborate with top-tier institutions worldwide, offering students access to diverse academic environments, advanced research facilities, and unique learning methodologies.

B. **Credit Transfer Mechanism:** Students' academic credits are seamlessly transferred under the Academic Bank of Credits (ABC) framework, adhering to the UGC guidelines. This ensures that their overseas academic achievements are recognized in their master's program at the home university.

C. **Global Learning Opportunities:** Students study courses in line with their chosen field at home university, enabling them to gain global exposure.

D. **Cultural and Professional Growth:** Exposure to different cultural contexts and professional environments will allow students to develop a global outlook, cross-cultural communication skills, and adaptability.

This pathway empowers students to emerge as global citizens with enhanced employability in international markets and academic credibility.

Pathway 3: Research Excellence

This pathway is ideal for students passionate about contributing to academic research and innovation. It provides a rigorous platform for independent inquiry, critical thinking, and advanced knowledge creation.

Key Highlights:

A. **Topic Selection:** Students identify a specific research area aligned with their academic background and career aspirations. Potential topics are often linked to emerging challenges, technological advancements, or societal needs in their field.

B. **Development of a Research Synopsis:** Students prepare a detailed synopsis covering aspects such as the problem statement, hypothesis, literature review, rationale, objectives, methodology, and analysis framework.

C. **Approval and Execution:** The research synopsis undergoes rigorous evaluation by the faculty. Once approved, students proceed to conduct their research under faculty mentorship, utilizing the proposed Deemed-to-be University's state-of-the-art labs and resources.

D. **Thesis Submission and Evaluation:** Students document their findings in a comprehensive thesis, which is evaluated based on originality, methodology, and contribution to the field.

This pathway is tailored for students aiming to pursue careers in academia, R&D, or doctoral studies. It fosters advanced analytical skills, independent inquiry, and a strong foundation for lifelong learning.

Award of Degree and Exit Options

- Upon successful completion of the two-year program, students will be awarded a Masters degree in their respective field.
- For students opting to exit the program after the first year, a Postgraduate Diploma will be conferred. This exit option is in line with the principles of the National Education Policy (NEP) 2020, ensuring flexibility and recognition for completed learning milestones.

This program structure reflects a commitment to providing a robust, outcome-oriented education that balances academic excellence with practical application and global perspectives. By offering multiple pathways, the program empowers students to chart their unique trajectories and emerge as leaders in their chosen fields.

These programs will be based on the following parameters:

- **Target Audience:** Students who are in their final year (graduating in the year program starts) or have successfully completed their B.E. / B.Tech. exams within the last five years of program.
- **Duration:** 2 years
- **Mode of Delivery:** Residential
- **Learning Outcomes:** Graduates are prepared to enter the workforce as highly skilled professionals or to pursue further research in their chosen fields. The program fosters domain, functional and behavioral skills to meet the demands of evolving industries.
- **Employment Opportunities:** Offers pathways into mid-to-senior roles such as Data Scientist, Automation Engineer, or Sustainability Analyst in industries like semiconductors, robotics, and environmental technology among others. With comprehensive training in emerging technologies, graduates are equipped for specialized positions.

The proposed Deemed-to-be University proposes to the above-mentioned programs in the following fields:

School/ Center	Specializations for Masters program
School of Manufacturing Technologies	• Smart Manufacturing Technology and Management • Automotive Systems Technology and Management
School of Manufacturing Desing and AI	• Semiconductor Manufacturing Technology and Management
School of Sustainability	• Sustainable Engineering and Management
School of Robotics	• Robotics Engineering and Management

Table 2 : Details for program offerings under each school

7.1.6 Proposed Curriculum and Syllabus

<u>Masters in Smart Manufacturing Technology and Management</u>

Semester Wise Pattern for Students admitted to Masters in Smart Manufacturing Technology and Management				
Year	**First Trimester**	**Credits**	**Second Trimester**	**Credits**
1	Essentials of Advanced Manufacturing	1	Industrial Robots	1
	Pneumatic Technology	1	Data Analytics	1
	Hydraulic Technology	1	PLC Programming with HMI and Ethernet Communication	1
	Servo/Stepper Systems and Smart Sensors	1	AI for Smart Manufacturing	1
	PLC Programming	1	Product Design and Rapid Prototyping for AM	1
	Software Coding	1	Project Management	1
	Industrial Internet of Things	1	Reliability and Quality for Engineers	1
	Data Visualization with Node RED Programming	1	Health, Safety and Environment	1
	Manufacturing Management	1	Sustainability for Smart Manufacturing	1
	Meta Skills -1	1	Meta Skills -2	1
	Total Credits	**10**	**Total Credits**	**10**
Year	**Third Trimester**		**Fourth Trimester**	

1	Collaborative Robots	1	Capstone Project	10
	Digital Twin in Manufacturing	1		
	Advanced Machining	1		
	Process Simulation	1		
	Digitalising Operation with MES	1		
	Cyber Physical Systems	1		
	Operational Excellence	1		
	Sustainability and Circular Economy	1		
	Sustainable Energy	1		
	Meta Skills - 3	1		
	Total Credits	**10**	**Total Credits**	**10**
Year	**First Semester**		**Second Semester**	
2	Academic Pathway	20	Academic Pathway	20
	Total Credits	**20**	**Total Credits**	**20**

Total Credits per year is 40 and each credit corresponds to 30 learning hours.

Year 1: First Trimester	
Course Name	Essential of Advanced Manufacturing
Credits	1
Learning Hours	30
Description	In this module, participants will be introduced to the key concepts of Industry 4.0 and the driving technologies for the convergence of digital and physical. It provides the fundamentals of industrial revolutions and the holistic perspective of the underlying concept of Industry 4.0 – a paradigm shift to the production of the future that integrates automation technology and information technology to enhance productivity, efficiency, and flexibility in manufacturing processes.
Outcomes	• Understand the development of industrial revolution towards Industry 4.0 • Understand the underlying concepts of Industry 4.0 • Understand the benefits of the application of the key technologies for manufacturing processes. • Identify the benefits of data-driven manufacturing process for flexible process design. • Recognize the opportunities for developing new business models and what to consider when implementing new strategies towards Industry 4.0 • Understand the important relationship between people, process, and technology to harness the full potential of Industry 4.0
Content	• Fundamental concept of Industry 4.0

	• Key differences between Industry 3.0 and 4.0
	• Overview of the core elements and technologies of Industry 4.0
	  ◦ Radio Frequency Identification System
	  ◦ Human-Machine Interface, HMI
	  ◦ Machine-to-Machine M2M Communication
	  ◦ Vertical and Horizontal Integration
	  ◦ Augmented reality
	• Demonstration of features and benefits of integrated automation with Industry 4.0 technologies
	• Social-technological developments and the consequences
	• Industry 4.0 implementation approach
	• Industry 4.0-driven competency development and change management

Year 1: First Trimester	
Course Name	Pneumatic Technology
Credits	1
Learning Hours	30
Description	This course is catered to participants with basic skills in handling pneumatic systems in industrial automation plants or equipment. The participant will be provided with an understanding of pneumatic and electro-pneumatic systems. Participants will be familiar with the design, construction, and operation, and maintenance requirements of pneumatic components. This includes the interpretation of circuit diagrams and symbols as well as the construction of pneumatic circuits.
Outcomes	• Understands the characteristics of pneumatic and electro-pneumatic systems. • Understands the fundamentals of compressed air generation. • Can identify and describe the design, features, and operation of pneumatic components. • Be able to identify and explain symbols for pneumatic components. • Can identifying root causes of component failures. • Can identify and describe the design, features, and operation of electric components. • Be able to design, assemble and test pneumatic and electro-pneumatic circuits. • Understand the different designing methods and their applications. • Able to setup and commission pneumatic and electro-pneumatic systems • Be able to troubleshoot various pneumatic circuits
Content	• Characteristics of pneumatic systems • Compressed air generation, distribution, and preparation • Construction and principle of pneumatic valves

	• Construction and principle of pneumatic working elements • Methods for the development of pneumatic systems • Maintenance requirements of pneumatic systems • Operation of pneumatic sequencing circuits • Design pneumatic circuits using cascade control method. • Characteristics of electro-pneumatic systems • Components and assemblies in the electrical signal control section • Construction and principle of the electrical elements • ISO fluid power symbols according to ISO 1219 • Designing electro-pneumatic circuits • Operation of electro-pneumatic sequencing circuits • Simulation and practical exercises

Year 1: First Trimester	
Course Name	Hydraulic Technology
Credits	1
Learning Hours	30
Description	This course is catered to participants with basic skills in handling hydraulic and electro-hydraulic systems in industries. Participants with be provided with the basic knowledge of the construction and function of hydraulic and electric components as well as to develop the ability to read, design and construct simple hydraulic circuits. Participants will also be provided with the knowledge of hydraulic control systems, a systematic approach to maintenance, troubleshooting and designing of hydraulic circuits.
Outcomes	• Characteristics of hydraulic and electro-hydraulic systems • Understands the physical principles of hydraulics. • Understand the design, features and operation of the components needed for the hydraulic power pack. • Can identify and describe the construction, design features, and operation of hydraulic components. • Identify and explain graphical symbols for hydraulic components. • Can identify and describe the design, features, and operation of electric components. • Be able to setup, commission, and test hydraulic and electro-hydraulic systems. • Can read and analyze hydraulic circuit diagrams. • Be able to design, assemble and test hydraulic circuits
Content	• Fundamental physical principles of hydraulics: • Function and construction of components used in the power supply section. • Characteristics and function of hydraulic actuators

	• Characteristics and function of pressure control valves: • Characteristics and function of directional control valves • Characteristics and function of flow control valves • Characteristics and function of non-return valves • Function and maintenance requirements of hydraulic components • Construction and principle of electrical switches, contacts, and electrical sensors • Characteristics and function of solenoid operated directional control valves. • ISO electrical and hydraulic symbols according to ISO 1219 • Development and layout of simple controls • Design and assemble hydraulic and electro-hydraulic circuits. • Simulation and practical exercises

Year 1: First Trimester	
Course Name	Servo/Stepper Systems and Smart Sensors
Credits	1
Learning Hours	30
Description	This course will cover the fundamental knowledge and skill on the different electric motors and the electro-mechanical drives. Participants will also be able to incorporate the motors to the electrical drive units and how it is used in the industry. In addition, this course will also cover the knowledge of operating principles of the various types of smart sensors used for handling and processing technology. Participants will be able to identify the various sensors and their applications in various industrial situations. Practical sessions on their usage will be provided.
Outcomes	• Able to explain the functional principles of motors. • Able to describe the functional principles of servo and stepper motors and controllers. • Understand the difference between the various types of encoders and identify their function and specific application. • Able to analyze a system consisting of different electric drives, controllers, brakes, gear boxes and explain their configuration and relationship. • Can differentiate between the various types of mechanical drives (axes) and explain their construction. • Can select the most appropriate components of an electrical drive for a given application. • Can explain the relevant parameters of the configuration software and their effect on the drive system. • Can work safely with an electrical drive and demonstrate the desire to conform with safe practice.

	• Able to identify the different types of industrial sensors. • Able to describe the functions, characteristics, and uses of binary proximity sensors. • Able to describe the functions, characteristics, and uses of analogue proximity sensors. • Able to describe the functions, characteristics, and uses of smart sensors. • Understand the connection and circuit technology for sensors. • Able to wire up the sensors
Content	• Introduction to Electrical Motors • Types of Industrial Motors: DC motors and AC motors • Stepper Motors, Servo Motors, Electromechanical system, Complete systems • Simulation and practical exercises • Fundamentals of sensors and Binary proximity sensors • Analogue proximity sensors • Connection and circuit technology and Smart sensors • Simulation and practical exercises

Year 1: First Trimester	
Course Name	PLC Programming
Credits	1
Learning Hours	30
Description	This course provides the participant with knowledge of construction and operation of a Programmable Logic Controller (PLC) and be able to translate control tasks into operational PLC programs. The participant would be able to write, enter, and execute application programs basedon the IEC 61131-3 standard. The use of the CP Lab will give the participant practical programming and troubleshooting skills.
Outcomes	• Understand the purpose, functions, and operations of a PLC. • Understand the classification of control systems. • Know the Input/output systems of PLC. • Know IEC 61131-3 and the programming languages. • Know the peripheral devices and interfacing. • Understand what is needed when selecting a PLC. • Using the PLC programming software • Be able to create a PLC project using PLC software. • Be able to program basic logic functions with the PLC. • Be able to program using signal edges, setting, and resetting outputs, timers and counters with the PLC. • Be able to write sequencing programs with the PLC.

	• Be able to add additional requirements to the PLC program. • Be able to commission and operate a PLC. • Be able to design function blocks. • Writing programs for automation lines • Be able to download the program to the CP Lab and test the program. • Be able to communicate between the stations of the CP Lab
Content	• Introduction to Programmable Logic Controllers (PLC) • Functions and applications of PLC • Design and mode of operation of a PLC and PLC addresses • Programming Languages according to IEC 61131-3 • Procedure for creating a PLC program. • Programming of control task from logic functions to sequencing • Programming additional tasks • Programming of the CP Lab • Multitasking with the PLC • Communication between PLCs and Testing the system. • Simulation and practical exercises

Year 1: First Trimester	
Course Name	Software Coding
Credits	1
Learning Hours	30
Description	This module offers a structured exploration of Python programming, aimed at equipping participants with essential coding skills and fostering a deep understanding of practical applications
Outcomes	• Understand Python programming with essential coding skills. • Will have a deep understanding of practical applications
Content	• Variables, Data Types, Control Structures. • Functions and Modular Code Design. • Imperative Data Structures: Lists, Tuples, Dictionaries. • File Handling and Exception Handling. • Object-Oriented Programming (OOP): Classes, Inheritance. • List Comprehensions, Lambda Functions. • NumPy, pandas for Data Manipulation.

Year 1: First Trimester	
Course Name	Industrial Internet of Things
Credits	1
Learning Hours	30
Description	This module offers students' knowledge on the Practical implementation of internet of things in an Industrial setting.

Outcomes	• Understand the fundamental concepts and business drivers on Industrial Internet of things. • Illustrate Industrial applications of Internet of Things (IOT) and Business drivers. Apply IOT business models. • Understand the difference between commercial IOT vs Industrial IOT. • Design and develop Internet of Things (IOT) Architecture for industry. • Understand the how of Artificial intelligence and machine learning are used for condition monitoring and predictive maintenance. • Develop cloud-based solutions for Industrial IOT monitoring and control.
Content	• Fundamental concepts and business drivers on Industrial Internet of things. • Industrial applications of Internet of Things (IOT) and Business drivers. • Commercial IOT vs Industrial IOT. • Internet of Things (IOT) Architecture for industry. • Use of Artificial intelligence and machine learning for condition monitoring and predictive maintenance. • Cloud-based solutions for Industrial IOT monitoring and control.

Year 1: First Trimester	
Course Name	Data Visualization with Node RED Programming
Credits	1
Learning Hours	30
Description	This course provides knowledge of visualization software and itsapplication. It teaches how to design dashboard to visualize data retrieved from a machine and other edge devices.
Outcomes	• Understand the basic knowledge of Node-Red • Setup communication between Node-Red and Programmable Logic Controller (PLC) • Collect real-time data collection from the PLC with an IoT software tool. • Design dashboard for control and data visualization • Consuming data from the internet • Transmitting data to the internet thru a flow-based programming tool
Content	• Overview of OT and IT convergence • Introduction of an IoT programming software • Configuration and setup of flow-based development tool • Familiarization of flow-based programming • Flow-based programming hands-on practical experience to visualize machine data

Year 1: First Trimester	
Course Name	Manufacturing Management

Credits	1
Learning Hours	30
Description	Through this module, students will be introduced to manufacturing management strategies such as Lean, 5S and Kaizen concepts, and how these approaches can be systematically connected with new opportunities of digitalization. Students will also hear from a local SME share on their Lean 4.0 journey. This module also introduces the global Smart Industry Readiness Index initiative. Students will learn about the self-diagnostic assessment tool and management planning tool to help companies embark on their digital transformation journey.
Outcomes	• Understand the competencies and qualifications for Industry 4.0 • Understand flexible production with modular and reconfigurable product design. • Understand the fundamental approaches to the configuration of a supply chain. • Understand the planning systems to shape the future as a supply chain manager. • Understand the process and applications of digital factory planning. • Understand and apply digital value stream analysis through practical examples. • Understand the opportunities of digitalization in Lean Management • Understand the Smart Industry Readiness Index and its application to Industry 4.0
Content	• From technology to management • Product service development • Demand and supply network • Configuration on planning systems (i.e., MRP and ERP) • Factory and facility planning • Industry 4.0 meets Lean Management • Kanban methodology • SCRUM methodology • Value Stream Analysis

Year 1: Second Trimester	
Course Name	Industrial Robotics
Credits	1
Learning Hours	30
Description	Robots remain an important part for automation and has increasingly played a vital role in improving process efficiency in manufacturing industry. This course provides a good overview of the essential knowledge about robotic automation with gripping and vacuum technology where participants will be

	provided with a wide knowledge of fundamentals in handling technology ranging from various types of end effector elements to different types of robot systems.
Outcomes	• Understand the mechanics behind robotics systems. • Describe the working principles behind the control of robot movement and speed. • Enunciate the principles of a motion control system. • Understand the mechanics behind collaborative robots. • Write, download, and test robot programs
Content	• Industrial robots • Collaborative robots • Simulation and practical exercises

Year 1: Second Trimester	
Course Name	PLC Programming with HMI and Ethernet Communication
Credits	1
Learning Hours	30
Description	This course will provide the participants with the basic knowledge of industrial networking concept and Human Machine Interface (HMI). The participants will also be able to write PLC programs based on IEC 61131-3 standard using a simulated production line (Modular Production System), setup Machine-to-Machine communication via Industrial Ethernet and display real time data and operator control with the HMI.
Outcomes	• Understand PLC data blocks and Program Organization Unit • Be able to create and reuse Function Blocks • Understand function libraries and solve automation tasks with it. • Be able to analyze automation requirements of a Modular Production System (MPS) • Be able to write a structured PLC program for the automation task. • Be able to optimize an existing automation control. • Know PLC program debugging technique and error troubleshooting. • Understand the use of HMI for automation control and monitoring. • Be able to design an operator interface with an HMI. Know the fundamentals of industrial ethernet networking. • Be able to configure/control a PROFINET device. • Be able to establish a machine-to-machine communication via PROFINET
Content	• Introduction to TIA Portal and Simatic S7 programming software • Organizational Blocks and creation of Functions and Function Blocks • Analyze, plan, and design PLC program for the automation requirements of a production machine. • Designing an operator interface with an HMI project.

	• Control and Monitoring of production machine with an HMI. Fundamentals of industrial communication network • Introduction to the main components of PROFINET & configuration of the network. • Field Input and output device control with PROFINET IO system. Machine to Machine communication via PROFINET • Practical programming and hardware setup exercises of the production line with industrial ethernet communication and HMI for control & operator interface

Year 1: Second Trimester	
Course Name	AI for Smart Manufacturing
Credits	1
Learning Hours	30
Description	This module is designed to provide a comprehensive understanding of how artificial intelligence, machine learning, and data analytics are applied in the manufacturing industry.
Outcomes	• Student will be able to understand fundamental concepts of AI and ML and their transformative role in manufacturing. • Understand predictive modelling, anomaly detection, optimization algorithms, and computer vision for process enhancement. • Understand data collection, cleaning, and pre-processing methods through hands-on sessions. • Will be able to implementation AI and ML algorithms in manufacturing and strategies for real-time data processing and decision-making.
Content	• Fundamental concepts of AI and ML and their transformative role in manufacturing. • Predictive modelling, anomaly detection, optimization algorithms, and computer vision for process enhancement. • Data collection, cleaning, and pre-processing methods through hands-on sessions. • Implementation of AI and ML algorithms in manufacturing and strategies for real-time data processing and decision-making. • Case studies, ethical considerations, and security challenges in manufacturing analytics. • Inclusion of best practices and insights from industry experts.

Year 1: Second Trimester	
Course Name	Product Desing and Rapid Prototyping for AM
Credits	1
Learning Hours	30

Description	This module will provide give learners hands-on exposure to key equipment used in the Additive Manufacturing Technology, and a better appreciation for Design for Additive Manufacturing (DfAM)
Outcomes	• Learn the various key industrial Additive Manufacturing Technologies. Understand the benefits and limitations of AM technology. Be able to develop concepts for AM production line setup. • Familiarize with industrial AM standards and certification. Develop suitable AM strategies for their companies
Content	• Understand fundamentals of AM design considerations • Design for AM (DfAM) • AM Technology & Material Selection • Explore techniques for AM design optimization (Case Studies) • Topology Optimization (lattice design) • Assembly Part integration • Functional simulations (digital twin) • Develop product & production AM strategy. • Product Design, Digital Inventory Concept • Hands-on workshops • Reverse Engineering - 3D part scanning, 3D CAD/Reverse Engineering • SolidWorks Simulations, 2D Engineering • 3D printing (Ultimate S5)

Year 1: Second Trimester	
Course Name	Project Management
Credits	1
Learning Hours	30
Description	The Project Management course provides an in-depth understanding of the principles, methodologies, and best practices essential for effectively managing projects from initiation to closure. Whether you're a seasoned professional seeking to enhance your skills or a newcomer to project management, this course offers a comprehensive foundation to excel in various industries.
Outcomes	• Comprehensive Understanding: • Project Initiation Skills • Robust Planning Competence • Scope Management Mastery • Effective Time and Schedule Management • Resource Allocation Proficiency • Risk Management Expertise • Quality Assurance and Control Skills • Strong Communication and Stakeholder Engagement • Adaptive Team Leadership

	• Ethical and Legal Awareness
Content	• Introduction to Project Management • Project Initiation • Project Planning • Scope Management • Time and Schedule Management • Resource Management • Risk Management • Quality Management • Communication and Stakeholder Management • Project Execution and Monitoring • Project Closure • Team Leadership and Management • Ethical and Legal Considerations

Year 1: Second Trimester	
Course Name	Reliability and Quality for Engineers
Credits	1
Learning Hours	30
Description	Reliability and Quality Control for Engineers is a comprehensive course that explores the principles, methodologies, and tools used to enhance the reliability and quality of engineering systems, products, and processes. The course equips students with the knowledge to assess and improve the performance, durability, and safety of engineering solutions across various industries.
Outcomes	• Understanding of Reliability and Quality Principles • Probability and Statistical Analysis • Reliability Modelling and Prediction • Failure Modes and Effects Analysis • Quality Management Systems • Design for Reliability and Quality • Reliability Testing and Evaluation • Root Cause Analysis • Application of Reliability and Quality Principles • Case Studies and Industry Examples
Content	• Introduction to Reliability and Quality • Probability and Statistics in Reliability • Failure Modes and Effects Analysis • Statistical Process Control • Quality Improvement Tools • Reliability and Quality in Safety-Critical Systems

	• Total Quality Management • Acceptance Sampling • Process Capability and Control • Reliability and Quality in Product Development • Group Projects and Presentations • Ethical considerations in reliability and quality engineering

Year 1: Second Trimester	
Course Name	Health, Safety and Environment
Credits	1
Learning Hours	30
Description	The Health, Safety, and Environment (HSE) Fundamentals course is designed to provide participants with a comprehensive understanding of the principles, regulations, and best practices necessary to ensure a safe and healthy working environment. This course emphasizes the importance of proactive HSE management in preventing accidents, minimizing risks, and promoting environmental sustainability across various industries.
Outcomes	• Comprehensive Understanding • Safety Awareness • Health and Wellness Promotion • Effective Safety Management • Environmental Responsibility • Risk Assessment Skills • Emergency Response Competence • Compliance Assurance • Proper PPE Usage • Ergonomics Awareness
Content	• Introduction to Health, Safety and Environment • Occupational Health and Wellness • Safety Management • Environmental Management • Risk Management and Mitigation • Emergency Preparedness and Response • Personal Protective Equipment • Workplace Ergonomics • Chemical and Biological Hazards • Electrical Safety • Confined Spaces and Height Safety

Year 1: Second Trimester

Course Name	Sustainability for Smart Manufacturing: Decarbonization Pathways and ESG Metrics, Measurement and Reporting
Credits	1
Learning Hours	30
Description	This comprehensive course provides an in-depth exploration of various pathways to achieve decarbonization across different sectors and industries, Environmental, Social, and Governance (ESG) principles. Participants will examine ESG policies, frameworks, and materiality assessments. By integrating these critical components, the course aims to equip professionals with the tools needed to drive sustainability and safety in their organizations.
Outcomes	• Develop actionable strategies for energy efficiency and sustainable transportation. • Analyze energy policies that facilitate decarbonization efforts in industrial sectors. • Integrate ESG concepts to promote sustainable and safe organizational practices. • Develop practical skills for assessing, measuring, and reporting on ESG performance. • Design and recommend effective administrative, engineering, and personal protective measures to mitigate identified risks.
Content	• Sustainability essentials: Reduce, Reuse, Recycle, Energy Efficiency, Sustainable Transportation, Conserve Water, Support Local, Sustainable Food Choices, Eco-friendly Products, Biodiversity Protection, Educate and Advocate • Industrial Decarbonization: GHGs, GHG Inventory Development Resources, Standards and Guidelines (GHG Protocol, ISO 14064 Standards), Energy policies in the context of decarbonization. Emission Sources (Scope 1, Scope 2, and Scope 3 emissions) and Calculation Methods • Science based Target Initiatives (SBTi) decarbonization. • Key Decarbonization Pathways: Energy Efficiency Improvements, Switching to Low-Carbon Energy Sources, Electrification of Processes, Carbon Capture, Utilization, and Storage (CCUS), Sustainable Feedstocks • ESG Policies • ESG frameworks: IFRS 1, IFRS 2 - Climate-Related Disclosures, Global Reporting Initiative (GRI), Sustainability Accounting Standards Board (SASB), Business Responsibility & Sustainability Reporting (BRSR) • ESG materiality assessment: assessing material issue to industry, engage stakeholder to assess the materials. • ESG ratings: Dow Jones Sustainability Index (DJSI) assessment, Morgan Stanley Capital International, Sustainalytics • Metrics: Environmental, Energy & Governance

	• Measurement: Data collection (automated systems, surveys, audits) • Water audit • Environmental: Water, energy efficiency, carbon intensity, EMS

Year 1: Third Trimester	
Course Name	Collaborative Robots
Credits	1
Learning Hours	30
Description	Robots remain an important part for automation and has increasingly played a vital role in improving process efficiency in manufacturing industry. This course provides a good overview of the essential knowledge about robotic automation with gripping and vacuum technology where participants will be provided with a wide knowledge of fundamentals in handling technology ranging from various types of end effector elements to different types of robot systems.
Outcomes	• Understand the mechanics behind robotics systems. • Describe the working principles behind the control of robot movement and speed. • Enunciate the principles of a motion control system. • Understand the mechanics behind collaborative robots. • Write, download, and test robot programs
Content	• Industrial robots • Collaborative robots • Simulation and practical exercises

Year 1: Third Trimester	
Course Name	Digital Twin in Manufacturing
Credits	1
Learning Hours	30
Description	This module covers Digital Twin concepts that includes the virtual commissioning and optimisation of a factory layout, ergonomics, and validation of manufacturing concepts.
Outcomes	Student will be able to visualise the asset, track changes, understand and optimise asset performance throughout the lifecycle of the product, predictive maintenance, and data-driven root-cause analysis resulting in improved efficiency.
Content	• Virtual design and commissioning of a factory layout • 3D design • Validation • Visualisation • Material flow logistics

	• Bottleneck analysis • Simulation driven planning and scheduling. • Throughput analysis • Design and verification of a manufacturing process in a 3D environment • Geometry validation and process-cell automation • Human modelling and ergonomics

Year 1: Third Trimester	
Course Name	Advance Machining (Additive and Subtractive using Metals)
Credits	1
Learning Hours	30
Description	The course on Advanced Machining (Additive and Subtractive using metals) is designed to provide students with an in-depth understanding of cutting-edge additive and subtractive methods, tools, and strategies used in modern manufacturing industries. Building upon the foundation of conventional manufacturing principles, this course delves into advanced technologies that enable precision, efficiency, and innovation in the production of complex components. Students will explore various additive and subtractive techniques, tool materials, simulation techniques, and emerging trends that are shaping the future of manufacturing.
Outcomes	Students will be able to evaluate and select suitable manufacturing processes for machining and additive manufacturing of advanced materials for a wide variety of applications. They will be able to differentiate between conventional processes and non-conventional processes and develop niche applications based on that. Additionally, this course would typically focus on providing students with a comprehensive understanding of state of art machining and additive techniques, tools, and processes used in modern manufacturing. These outcomes aim to equip students with the necessary skills and knowledge to excel in the field of advanced machining and additive manufacturing.

Content	• Introduction to Advanced Machining Processes: Overview of conventional vs. advanced machining processes, Advantages, and limitations of advanced machining techniques
	    • High-Speed Machining,
	    • Ultrasonic Machining,
	    • Electrical Discharge Machining (EDM),
	    • Laser Machining,
	    • Abrasive Jet Machining
	• Fundamental Knowledge of Metal Additive Manufacturing: Common additive manufacturing technologies; Selective Laser Sintering (SLS), Selection Laser Melting (SLM), Jetting, 3D Printing, Laser Engineering Net Shaping (LENS), Laminated Object Manufacturing (LOM), Electron

	Beam Melting (EBM) Capabilities, materials, costs, advantages, and limitations of different systems. • CAD Modelling for 3D printing: 3D Scanning and digitization, data handling &reduction Methods, AM Software: data formats and standardization, Slicing algorithms: -uniform flat layer slicing, adaptive slicing, Process-path generation: Process-path algorithms, rasterization, part Orientation and support generation.

Year 1: Third Trimester	
Course Name	Process Simulation
Credits	1
Learning Hours	30
Description	To equip students with the knowledge and skills required to utilize process simulation tools in the design, analysis, and optimization of smart manufacturing systems, enabling efficient and flexible production processes.
Outcomes	• Understand the principles of process simulation and its role in smart manufacturing. • Utilize simulation software to create and analyze manufacturing models. • Evaluate the performance of manufacturing processes using simulation results. • Apply optimization techniques to enhance process efficiency.
Content	• Introduction to Process Simulation • Basics of Process Simulation • Types of simulation (discrete event, continuous, agent-based) • Simulation Tools and Software tools • Modelling Manufacturing Processes • Identifying Key Processes • Production flow, resource allocation, and logistics • Creating Simulation Models • Defining entities, processes, and resources • Examples of successful process simulation in various industries

Year 1: Third Trimester	
Course Name	Digitalizing Operation with MES
Credits	1
Learning Hours	30
Description	Practical implementation of a smart (networked) factory centrally controlled by the MES for production control, data collection and process analysis will be demonstrated.
Outcomes	• Understand the basic features of MES such as order management, detailed planning and control, data collection, etc.

	• Will be able to use the MES to optimise production control. • Will be able to track the system performance with MES
Content	• Characteristic of Cyber Physical System and the modularity & flexibility concept • Basic features of MES such as order management, detailed planning and control, data collection, etc • Using the MES to optimise production control. • Tracking the system performance with MES

Year 1: Third Trimester	
Course Name	Cyber Physical Systems
Credits	1
Learning Hours	30
Description	This module provides the overview of the characteristics and components of a Cyber Physical System (CPS) and how it can form an important part of Industry 4.0. The concept of the convergence between the Information Technology (IT) and Operation Technology (OT) will also be covered to see how it brings the automation system to another level of intelligence with a new dimension of unprecedented connectivity.
Outcomes	• The student will learn the communication platform architectures for automation and the RAMI 4.0, ISA-95 and the OSI Layer model. • Understand elements of CPS and its importance for a smart production system • Understand communication networks. • Understand various of technologies enabling connectivity, communication protocols, and cooperation between systems in the highly digitalised manufacturing environment. • Understand essentials of the digital representation of the networked Cyber Physical System • CPS for Advanced Digital Manufacturing
Content	• Introduction to CPS – an important characteristic of Industry 4.0 • Elements of CPS and its importance for a smart production system • Communication networks and the physical systems within a single entity • Overview of technologies enabling connectivity, open communication protocols, and cooperation between systems in the highly digitalised manufacturing environment • Essentials of the digital representation of the networked Cyber Physical System • CPS for Advanced Digital Manufacturing • Case studies and discussions

Year 1: Third Trimester	
Course Name	Operational Excellence
Credits	1
Learning Hours	30
Description	This course delves into the principles, methodologies, and best practices that underpin operational excellence, equipping participants with the tools to optimize processes, enhance productivity, and drive innovation within manufacturing operations
Outcomes	• Students will learn the best practices that underpin operational excellence. • Will learn various tools to optimize processes, enhance productivity, and drive innovation within manufacturing operations. • Will learn Lean Manufacturing Principles and Practices • Will learn Six Sigma Methodology for Process Improvement
Content	• Introduction to Operational Excellence in Advanced Manufacturing • Lean Manufacturing Principles and Practices • Six Sigma Methodology for Process Improvement • Total Productive Maintenance (TPM) and Asset Management • Continuous Improvement Culture and Kaizen • Quality Management Systems (QMS) and ISO Standards • Change Management and Leadership in Operational Excellence • Supply Chain Optimization and Vendor Management • Advanced Manufacturing Technologies and Industry 4.0 Integration • Risk Management and Contingency Planning • Operational Excellence Metrics and Performance Measurement • Sustainability and Environmental Excellence in Manufacturing • Case Studies and Real-world Applications • Future Trends in Operational Excellence

Year 1: Third Trimester	
Course Name	Sustainability and Circular Economy
Credits	1
Learning Hours	30
Description	This course provides an in-depth exploration of the circular economy (CE) concept and its practical applications in industrial contexts. It is designed for students and professionals interested in understanding how circular economy principles can be integrated into industrial processes to achieve sustainability and efficiency. The course covers fundamental principles of circular economy, strategies for implementing circular practices in industrial settings, and case studies that illustrate real-world applications and innovations.

Outcomes	• Assess the benefits and challenges of implementing circular economy practices in various industrial contexts. • Analyze and adopt best practices from real-world case studies in recycling and upcycling. • Evaluate and apply material and energy strategies to support sustainable industrial practices. • Identify and leverage innovative approaches and technologies for upcycling and waste valorization.

Content	• The circular economy concept and aspiration
	    • Principles of Circular Economy: Eliminate waste and pollution, Circulate products and materials (at their highest value), Process efficiency and Regenerate nature.
	    • Benefits and challenges in industrial contexts
	• Life Cycle Assessment
	    • Main phases of LCA: Goal and scope definition, Inventory analysis, Impact assessment, and Interpretation
	    • LCA-related assessments:
	    • Standards for LCA in ISO 14040 and 14044
	    • Comparing LCA with other approaches: Cradle-to-cradle, Circular economy
	• Circularity economy strategies in Industrial processes
	• Resource Efficiency and Waste Minimization
	• Recycling and Upcycling in Industrial Processes: Types of industrial recycling processes (e.g., closed-loop, open-loop), Upcycling and the creation of higher-value products from waste.
	• Case Studies in Recycling and Upcycling
	• Circular economy priorities: Design for Longevity, Resource Efficiency, Waste Reduction and Management
	• Circular economy strategies for materials, energy, and water in industry

Year 1: Third Trimester	
Course Name	Sustainable Energy
Credits	1
Learning Hours	30
Description	This course provides a comprehensive study of renewable energy technologies (RETs) and energy storage systems. It covers the fundamentals of various renewable energy sources, including solar, wind, hydropower, biomass, and geothermal. The course also explores advanced energy storage materials and devices, hydrogen storage methods, and the integration of these technologies into electrical grids. Participants will gain practical insights into the latest technologies and strategies for enhancing energy efficiency and sustainability.

Outcomes	• Assess the benefits, limitations, and applications of various renewable energy technologies. • Understand the operation, advantages, and challenges of each type of energy storage technology. • Develop strategies for effective integration of energy storage technologies to enhance grid stability and energy management.

Content	• Renewable Energy Technologies/ Renewable Energy Solutions
	    • Different types of renewables and their fundamentals
	    • Solar Energy Technologies: PV, Solar thermal
	    • Wind Energy Technologies: Wind turbine, Offshore
	    • Hydropower Technologies: Hydroelectric power plants, Tidal and wave energy
	    • Biomass Energy Technologies: Biomass power generation, Biofuels
	    • Geothermal Energy Technologies: Geothermal Power Generation, Geothermal Heat Pumps
	    • Hydrogen Energy Technologies: Electrolysers, fuel cells
	• Integration of renewable energy into electrical grids: Integration strategies and grid integration challenges of renewables.
	• Industrial energy efficiencies
	• Energy audit: Simulation, Installation, Monitoring, GHG calculations, and Carbon credits
	• Industrial Decarbonisation Pathways
	• Energy Conversion & Storage Systems
	    • Batteries, components of batteries, Battery Configuration & Fabrication
	    • Supercapacitors
	    • Thermal Energy Storage
	    • Pumped-hydro Energy Storage

Year 1: Fourth Trimester	
Course Name	Capstone Project
Credits	10
Learning Hours	300
Description	The culmination of theoretical insights and practical skills, the industry internship offers students the opportunity to engage with real-world manufacturing scenarios. Under the guidance of experienced professionals, participants navigate the complexities of Industry 4.0 in action, contributing to projects that drive innovation and transformation
Outcomes	The internship serves as a bridge between academic learning and industrial practice, enabling students to apply their knowledge, collaborate with

	industry experts, and gain valuable insights into the intricacies of modern manufacturing. By immersing themselves in practical challenges, students refine their skillset, broaden their perspectives, and emerge as adept contributors to the industry 4.0 landscape.

Automotive Systems Technology and Management

Semester Wise Pattern for Students admitted to Masters in Automotive Systems Technology and Management				
Year	**First Trimester**	**Credits**	**Second Trimester**	**Credits**
1	Fundamentals of Automobile (Automobile an integrated system)	2	Automotive Manufacturing processes (Stamping, Welding, Forming, Sheet metal operations etc.)	2
	Automotive design (CAD/CAE by AUTOCAD, CATIA)	2	Accelerated Product Development (Product Life Cycle Management (PLM), Digital Twin in Automotive)	2
	Internal Combustion Engines	2	Fundamentals of Hybrid and Electric Vehicles	2
	Automotive power trains	2	EV Power Train Engineering	2
	Fundamentals of Project & Finance Management	2	Reliability and Quality for Engineers, Health, Safety and Environment	2
	Total Credits	**10**	**Total Credits**	**10**
Year	**Third Trimester**		**Fourth Trimester**	
1	Product design and rapid prototyping for automotive	2	Capstone Project	
	Smart Manufacturing for automotive sector (Robotics, PLC, SCADA, HMI etc.)	2		
	Connected and Autonomous Vehicles Fundamentals	2		
	Noise, Vibration and Harshness (NVH)	2		
	Manufacturing Management	2		
	Total Credits	**10**	**Total Credits**	**10**
Year	**First Semester**		**Second Semester**	
2	Academic Pathway	20	Academic Pathway	20
	Total Credits	**20**	**Total Credits**	**20**

Total Credits per year is 40 and each credit corresponds to 30 learning hours.

Year 1: First Trimester	
Course Name	Fundamentals of Automobile (Automobile an integrated system)
Credits	2
Learning Hours	60

Description	To provide students with a comprehensive understanding of the fundamental principles of automobile design, operation, and technology, preparing them for advanced studies in the automotive field.
Outcomes	• Describe the current trends in the automotive industry. • Identify and explain the basic components and systems of automobiles. • Understand the principles of vehicle dynamics and how they affect performance. • Recognize the role of electrical and electronic systems in modern vehicles. • Discuss emerging technologies and their implications for the future of the automotive industry.
Content	• Overview of Automotive Systems • Chassis and Body Systems • Powertrain and Drivetrain Basics • Vehicle Dynamics and Performance • Electrical and Electronics Systems • Future Trends: Autonomous and Connected Features

Year 1: First Trimester	
Course Name	Automotive design (CAD/CAE by AUTOCAD, CATIA)
Credits	2
Learning Hours	60
Description	To equip students with the skills and knowledge necessary to utilize Computer-Aided Design (CAD) and Computer-Aided Engineering (CAE) tools, specifically AutoCAD and CATIA, for effective automotive design and engineering processes.
Outcomes	• Understand CAD/CAE Principles. • Utilize AutoCAD for 2D and 3D modeling, including creating technical drawings and schematics relevant to automotive components. • Use CATIA for advanced 3D modeling, surface modeling, and assembly design, focusing on automotive applications. • Perform basic simulations using CAE tools to analyze the performance, strength, and behavior of automotive components under various conditions.
Content	• Introduction to CAD/CAE and AutoCAD Basics • 2D Drafting and 3D Modeling Using CATIA • Assembly and Surface Design Techniques • Introduction to Simulation and Analysis Tools

Year 1: First Trimester	
Course Name	Internal Combustion Engines
Credits	2

Learning Hours	60
Description	To provide students with a thorough understanding of the principles, design, operation, and performance characteristics of internal combustion engines, enabling them to analyze and improve engine performance in automotive applications.
Outcomes	• Explain Engine Fundamentals. • Identify Engine Components. • Analyze Engine Cycle. • Assess engine performance using key metrics such as horsepower, torque, fuel efficiency, and emissions. • Discuss Emission Standards.
Content	• Combustion and Thermodynamics Basics • SI and CI Engines: Design and Operations • Engine Systems: Cooling, Lubrication, and Fuel Injection • Emission Control and Regulations • Turbocharging and Downsizing Trends

Year 1: First Trimester	
Course Name	Automotive power trains
Credits	2
Learning Hours	60
Description	To provide students with a comprehensive understanding of automotive powertrain systems, including their design, operation, and integration within vehicles, enabling students to analyze and optimize powertrain performance for various applications.
Outcomes	• Understand Powertrain Fundamentals. • Analyze Powertrain Configurations. • Evaluate Transmission Systems including manual and automatic. • Analyze key performance indicators such as acceleration, fuel efficiency, and emissions related to powertrain systems.
Content	• Advanced Power Transmission Systems • Manual and Automatic Transmissions • Differentials, Axles, and Driveshafts • Powertrain Efficiency and Testing • EV Powertrain vs. Traditional Powertrain

Year 1: First Trimester	
Course Name	Fundamentals of Project & Finance Management
Credits	2
Learning Hours	60

Description	The Project Management course provides an in-depth understanding of the principles, methodologies, and best practices essential for effectively managing projects from initiation to closure. Whether you're a seasoned professional seeking to enhance your skills or a newcomer to project management, this course offers a comprehensive foundation to excel in various industries.
Outcomes	• Project Initiation Skills • Robust Planning Competence • Scope Management Mastery • Effective Time and Schedule Management • Resource Allocation Proficiency • Risk Management Expertise • Quality Assurance and Control Skills • Strong Communication and Stakeholder Engagement • Adaptive Team Leadership • Ethical and Legal Awareness
Content	• Introduction to Project Management • Financial Basics: Budgeting, ROI, and Cost Analysis • Risk Management and Mitigation Strategies • Scheduling Tools (MS Project, Gantt Charts) • Stakeholder Communication and Leadership

Year 1: Second Trimester	
Course Name	Automotive Manufacturing processes (Stamping, Welding, Forming, Sheet metal operations etc.)
Credits	2
Learning Hours	60
Description	To provide students with a comprehensive understanding of the various manufacturing processes used in the automotive industry, including stamping, welding, forming, and sheet metal operations, and to equip them with the skills necessary to analyze and optimize these processes for improved efficiency and quality.
Outcomes	• Identify Manufacturing Processes. • Analyze Process Selection. • Explore Automation in Manufacturing.
Content	• Overview of Manufacturing Processes • Stamping and Forging Techniques • Welding and Joining Methods • Sheet Metal Operations • Automation in Manufacturing

Year 1: Second Trimester

Course Name	Accelerated Product Development (Product Life Cycle Management (PLM), Digital Twin in Automotive)
Credits	2
Learning Hours	60
Description	To equip students with the knowledge and skills necessary to understand and apply concepts of Accelerated Product Development, focusing on Product Life Cycle Management (PLM) and Digital Twin technology, to enhance innovation, efficiency, and collaboration in automotive product development.
Outcomes	• Understand PLM Principles. • Analyze PLM Tools and Processes. • Explore Digital Twin Technology. • Implement Digital Twin Solutions.
Content	• Introduction to Product Lifecycle Management • Concept of Digital Twin and Applications • Tools for Accelerated Product Development • Design Validation with Digital Twin • Case Studies from Industry

Year 1: Second Trimester	
Course Name	Fundamentals of Hybrid and Electric Vehicles
Credits	2
Learning Hours	60
Description	To provide students with a comprehensive understanding of the principles, technologies, and design considerations associated with hybrid and electric vehicles (HEVs and EVs), preparing them for careers in the evolving automotive landscape.
Outcomes	• Understand Vehicle Types. • Explain Powertrain Components. • Analyze Energy Sources. • Evaluate Charging Infrastructure. • Explore Regulatory Standards. Investigate Future Trends.
Content	• Basics of Hybrid and Electric Vehicle Technologies • Battery Systems and Energy Storage • Power Electronics in HEVs • Hybrid Configurations and Control Strategies • Charging Infrastructure and Energy Management • Case Studies and Group Discussion

Year 1: Second Trimester	
Course Name	EV Power Train Engineering

Credits	2
Learning Hours	60
Description	To provide students with an in-depth understanding of the design, analysis, and optimization of electric vehicle (EV) powertrains, focusing on components such as electric motors, batteries, and control systems, enabling them to contribute effectively to the development of advanced electric vehicle technologies.
Outcomes	• Understand EV Powertrain Components. • Analyze Electric Motor Operations. • Assess Battery Technologies. • Explore Energy Management Systems. • Design and Simulate Powertrain Systems. • Evaluate Charging Solutions.
Content	• Key Components of EV Powertrains • Battery Design and Thermal Management • Motor Control Systems and Efficiency • Powertrain Integration and Testing • Innovations in EV Technology • Lab Work: Simulating an EV Powertrain

Year 1: Second Trimester	
Course Name	Reliability and Quality for Engineers, Health, Safety and Environment
Credits	2
Learning Hours	60
Description	Reliability and Quality Control for Engineers is a comprehensive course that explores the principles, methodologies, and tools used to enhance the reliability and quality of engineering systems, products, and processes. The course equips students with the knowledge to assess and improve the performance, durability, and safety of engineering solutions across various industries.
Outcomes	• Probability and Statistical Analysis • Reliability Modelling and Prediction • Failure Modes and Effects Analysis • Quality Management Systems • Design for Reliability and Quality • Reliability Testing and Evaluation • Root Cause Analysis • Application of Reliability and Quality Principles • Case Studies and Industry Examples
Content	• Reliability Engineering Fundamentals • Quality Control Tools • FMEA and Fault Tree Analysis

	• Health and Safety Standards in Manufacturing • Environmental Management in Automotive

Year 1: Third Trimester	
Course Name	Product design and rapid prototyping for automotive
Credits	2
Learning Hours	60
Description	This module will provide give learners hands-on exposure to key equipment used in the Additive Manufacturing Technology, and a better appreciation for Design for Additive Manufacturing (DfAM).
Outcomes	• Learn the various key industrial Additive Manufacturing Technologies. • Understand the benefits and limitations of AM technology. • Be able to develop concepts for AM production line setup. • Familiarize with industrial AM standards and certification. • Develop suitable AM strategies for their companies.
Content	• Introduction to Rapid Prototyping Tools • Advanced 3D Printing for Automotive Components • Reverse Engineering Basics • Design Validation Techniques • Hands-on Lab: Prototyping a Component

Year 1: Third Trimester	
Course Name	Smart Manufacturing for automotive sector (Robotics, PLC, SCADA, HMI etc.)
Credits	2
Learning Hours	60
Description	This course will provide the participants with the basic knowledge of industrial networking concept and Human Machine Interface (HMI). The participants will also be able to write PLC programs based on IEC 61131-3 standard using a simulated production line (Modular Production System), setup Machine-to-Machine communication via Industrial Ethernet and display real time data and operator control with the HMI.
Outcomes	• Understand PLC data blocks and Program Organization Unit • Be able to create and reuse Function Blocks • Understand function libraries and solve automation tasks with it. • Be able to analyze automation requirements of a Modular Production System (MPS) • Be able to write a structured PLC program for the automation task. • Be able to optimize an existing automation control. • Know PLC program debugging technique and error troubleshooting. • Understand the use of HMI for automation control and monitoring.

	• Be able to design an operator interface with an HMI. Know the fundamentals of industrial ethernet networking. • Be able to configure/control a PROFINET device. • Be able to establish a machine-to-machine communication via PROFINET
Content	• Introduction to Smart Manufacturing • Robotics and Applications in Automotive • PLC, SCADA, and HMI Systems Overview • Data Analytics and IIoT in Manufacturing • Lab Sessions: Programming PLC and HMI

Year 1: Third Trimester	
Course Name	Connected and Autonomous Vehicles Fundamentals
Credits	2
Learning Hours	60
Description	To provide students with a comprehensive understanding of the technologies, systems, and implications associated with connected and autonomous vehicles (CAVs), preparing them for careers in the rapidly evolving automotive industry focused on intelligent transportation systems.
Outcomes	• Understand CAV Technologies. • Analyze Autonomous Driving Levels, • Explore Vehicle-to-Everything (V2X) Communication. • Evaluate Sensor Technologies. • Discuss Safety and Security Concerns.
Content	• Basics of Connected Vehicle Systems • Sensors and Perception Systems • AI and Machine Learning in Autonomous Vehicles • Communication Protocols (V2X) • Trends and Challenges in Autonomous Driving • Lab: Simulating Connected Vehicle Scenarios

Year 1: Third Trimester	
Course Name	Noise, Vibration and Harshness (NVH)
Credits	2
Learning Hours	60
Description	To provide students with a comprehensive understanding of noise, vibration, and harshness (NVH) concepts in the automotive industry, including measurement techniques, analysis methods, and strategies for minimizing NVH in vehicle design and development.
Outcomes	• Understand NVH Concepts. • Identify NVH Sources.

	• Measure NVH Levels. • Analyze NVH Data. • Evaluate NVH Performance.
Content	• Basics of NVH and Its Impact on Vehicles • Noise Sources and Control Methods • Vibration Analysis and Damping • Lab: Testing and Reducing NVH in Automotive Components • NVH in Electric Vehicles • Case Studies and Project Work

Year 1: Third Trimester	
Course Name	Manufacturing Management
Credits	2
Learning Hours	60
Description	Through this module, students will be introduced to manufacturing management strategies such as Lean, 5S and Kaizen concepts, and how these approaches can be systematically connected with new opportunities of digitalization. Students will also hear from a local SME share on their Lean 4.0 journey. This module also introduces the global Smart Industry Readiness Index initiative. Students will learn about the self-diagnostic assessment tool and management planning tool to help companies embark on their digital transformation journey.
Outcomes	• Understand the competencies and qualifications for Industry 4.0 • Understand flexible production with modular and reconfigurable product design. • Understand the fundamental approaches to the configuration of a supply chain. • Understand the planning systems to shape the future as a supply chain manager. • Understand the process and applications of digital factory planning. • Understand and apply digital value stream analysis through practical examples. • Understand the opportunities of digitalization in Lean Management • Understand the Smart Industry Readiness Index and its application to Industry 4.0.
Content	• Introduction to Lean and Agile Manufacturing • Production Planning and Control • Supply Chain Management Basics • Costing and Resource Optimization • Sustainability Practices in Manufacturing • Case Studies and Industry Interaction

Year 1: Fourth Trimester	
Course Name	Capstone Project
Credits	10
Learning Hours	300
Description	The culmination of theoretical insights and practical skills, the industry internship offers students the opportunity to engage with real-world manufacturing scenarios. Under the guidance of experienced professionals, participants navigate the complexities of Industry 4.0 in action, contributing to projects that drive innovation and transformation
Outcomes	The internship serves as a bridge between academic learning and industrial practice, enabling students to apply their knowledge, collaborate with industry experts, and gain valuable insights into the intricacies of modern manufacturing. By immersing themselves in practical challenges, students refine their skillset, broaden their perspectives, and emerge as adept contributors to the industry 4.0 landscape.

Masters in Semiconductor Manufacturing Technology and Management

Semester Wise Pattern for Students admitted to Masters in Semiconductor Manufacturing Technology and Management				
Year	**First Trimester**	**Credits**	**Second Trimester**	**Credits**
1	Semiconductor Backend Processing Fundamentals	2	Multiphysics Modelling (Ace+/ANSYS)	2
	Materials Engineering & Characterization	2	Automated equipment testing & Debugging	2
	Semiconductor Fabrication Technology & Process fundamentals	2	Software Coding & Fundamental of AI in Semiconductors (Python)	2
	Fundamentals of Semiconductor Devices	2	Reliability and Quality for Engineers	2
	Optoelectronics and photovoltaic devices	2	Advanced Packaging; Design & SMT	2
	Total Credits	**10**	**Total Credits**	**10**
Year	**Third Trimester**		**Fourth Trimester**	
1	Industrial Safety for Semiconductors Manufacturing	2	Capstone Project	
	Operational Excellence & Supply Chain Management	2		
	Fundamentals of Project & Finance Management	2		
	Circular Economy and Sustainability in Semiconductor Manufacturing	2		
	Elective	2		
	Total Credits	**10**	**Total Credits**	**10**
Year	**First Semester**		**Second Semester**	
2	Academic Pathway	20	Academic Pathway	20
	Total Credits	**20**	**Total Credits**	**20**

Total Credits per year is 40 and each credit corresponds to 30 learning hours.

Year 1: First Trimester	
Course Name	Semiconductor Backend Processing Fundamentals
Credits	2
Learning Hours	60
Description	The course provides students with a comprehensive understanding of the critical processes involved in semiconductor manufacturing after wafer

	fabrication. Focusing on key stages such as wafer testing, assembly, packaging, and quality control, the course covers essential techniques including wafer dicing, die attach, wire bonding, flip-chip bonding, and advanced packaging methods like system-in-package (SiP) and 3D packaging. Students will explore automation, robotics, and smart manufacturing principles, including the application of AI, IoT, and real-time data monitoring to optimize backend operations. By the end of the course, students will be equipped to manage backend processing in semiconductor production, understand emerging trends, and apply industry 4.0 technologies to improve efficiency and sustainability in modern manufacturing environments.
Outcomes	Understand and apply key backend manufacturing processes, including wafer testing, die attach, wire bonding, and advanced packaging techniques. They will gain proficiency in evaluating and implementing quality control measures to ensure high-yield production, while leveraging automation, robotics, and smart manufacturing technologies to optimize backend workflows. Students will also develop the ability to assess emerging trends in semiconductor packaging and testing, and apply industry 4.0 tools to enhance efficiency, reliability, and sustainability in semiconductor manufacturing environments.
Content	• Introduction to Memory Packaging and NPI Fundamentals: Introduction to Package: Manufacturing; Die Preparation Step; Die Attach Step; Wire Bond Step; Flip-Chip & Underfill Process; Encapsulation & Laser Marking; Solder Ball Attach & Reflow; Singulation & assembly Challenges. Package Materials; EFA & PFA; Inspection; Silicon Failures; Etching/Decapsulation, Dye & Pry; Electrical Failure Analysis – Fault Isolation • EFA - TDR (Time Domain Reflectometry); ESD; Introduction to Industrial Quality in ATMP: • FMEA; Quality Control Plan; MSA/Calibration; Introduction to statistical process control. • Fault Detection Control (FDC) &Run-to-Run Control (R2R)

Year 1: First Trimester	
Course Name	Materials Engineering & Characterization
Credits	2
Learning Hours	60
Description	The course introduces students to the properties, selection, and processing of materials used in smart manufacturing. The course covers fundamental concepts in materials science, including metals, polymers, ceramics, and composites, and their role in modern manufacturing applications. Students will learn key characterization techniques such as microscopy, spectroscopy, and mechanical testing, to assess material performance and

	quality. Emphasis will be placed on using advanced characterization methods for optimizing material properties in manufacturing processes, aligning with Industry 4.0 principles and sustainable practices.
Outcomes	Students will be able to understand the properties and selection criteria of various materials, apply characterization techniques to evaluate material properties, and integrate smart manufacturing technologies to optimize material performance in production. They will also develop skills in using advanced tools for material testing, ensuring quality and sustainability in manufacturing processes.
Content	• Fundamentals of Crystal structure: Geometry, Unit cell, Lattice, Symmetry, Miller indices, packing, voids Crystal Defects and Imperfection: Point, Line, Surface and Volume Defects • Common Techniques for Crystal Growth: Czochralski, Float-Zone, Bridgman etc. • The Process of Creating Silicon Wafers – From Ingot to Product. • Un-patterned Wafer Inspection.

Year 1: First Trimester	
Course Name	Semiconductor Fabrication Technology & Process fundamentals
Credits	2
Learning Hours	60
Description	The course introduces the essential processes involved in semiconductor device manufacturing. Students will explore key fabrication techniques, including photolithography, etching, doping, deposition, and chemical mechanical planarization (CMP), as well as the equipment used in these processes. The course emphasizes the importance of process integration, cleanroom environments, and quality control in semiconductor fabrication, preparing students to work with advanced manufacturing systems in the semiconductor industry.
Outcomes	Students will be able to understand and explain the fundamental semiconductor fabrication processes, apply key techniques such as photolithography and etching, and demonstrate an understanding of process integration and quality control. They will also be equipped to work with semiconductor manufacturing tools and contribute to process optimization in a cleanroom environment.
Content	• Introduction to Applications of Semiconductors • Materials involved in fabrications, • Manufacturing Processes Fundamentals: - oxidation, diffusion, ion implantation, lithography wet etching, dry etching. • Thin film Deposition Techniques: Thermal, e-beam, • Sputtering (DC/RF, ICP, magnetron), CVD (LPCVD, PECVD, MOCVD, ALD)

	• Unit Process and Device Evaluation: SEM, TEM • EDX, AFM, Ellipsometry XRD, XPS, SIMS, Hall effect • Metallization From Device Point of View: Ohmic • Schottky

Year 1: First Trimester	
Course Name	Fundamentals of Semiconductor Devices
Credits	2
Learning Hours	60
Description	To provide students with a comprehensive understanding of the fundamental principles, materials, and fabrication processes of semiconductor devices, enabling them to comprehend the operation and applications of various semiconductor technologies.
Outcomes	• Understand Semiconductor Physics. • Identify Semiconductor Materials. • Analyze Semiconductor Device Structures. • Evaluate Device Characteristics.
Content	• Energy Band and Charge Carriers • Junctions (Schottky and Ohmic) • Diodes and BJTs • MOSFETs

Year 1: First Trimester	
Course Name	Optoelectronics and photovoltaic devices
Credits	2
Learning Hours	60
Description	To provide students with a comprehensive understanding of optoelectronic devices and photovoltaic technology, focusing on their principles, design, fabrication processes, and applications in the semiconductor industry.
Outcomes	• Understand Optoelectronic Principles. • Identify Optoelectronic Devices. • Analyze Photovoltaic Technologies. • Evaluate Device Performance.
Content	• Semiconductor optoelectronic materials and Heterostructures • Interaction of photons with electrons and holes in a semiconductor • Amplification by stimulated emission, The semiconductor laser amplifier • Absorption in semiconductors and quantum wells, Electro-absorption modulator • Injection electroluminescence, Light emitting diode and their characteristics • Semiconductor laser: Device structure and characteristics

	• Single frequency lasers, VCSEL and Quantum well lasers • Semiconductor photodetectors, General characteristics • Photodiodes: PIN diode and APD. Photonic Integrated Circuits

Year 1: Second Trimester	
Course Name	Multiphysics Modelling (Ace+/ANSYS)
Credits	2
Learning Hours	60
Description	To equip students with the skills and knowledge necessary to utilize Multiphysics modeling software, specifically ACE+ and ANSYS, for simulating complex physical phenomena in semiconductor manufacturing processes, enabling optimization and innovation in device design and fabrication.
Outcomes	• Understand Multiphysics Principles. • Demonstrate proficiency in using ACE+ and ANSYS software for setting up, running, and analyzing Multiphysics simulations relevant to semiconductor processes. • Analyze Simulation Results.
Content	• Introduction to Multiphysics in Semiconductor Applications: Overview of Semiconductor Devices; Key processes in semiconductor fabrication and packaging; Challenges in Multiphysics modeling for semiconductors; Introduction to Tools Ansys and Ace+ features for semiconductor applications. • Thermal Management in Semiconductor Devices: Fundamentals of Heat Transfer in Semiconductors; Heat generation in ICs, transistors, and power devices; Importance of thermal modeling in reliability and performance; Thermal Modeling with Ansys; Steady-state and transient thermal simulations; Applications: Junction temperature analysis, thermal vias, and heat spreaders; Thermal Coupling in Ace+; Integration of fluid and thermal simulations for package cooling. • Mechanical Stress and Reliability: Mechanical Stress in Semiconductor Packaging; Thermo-mechanical stress due to thermal expansion mismatches; Creep, fatigue, and fracture analysis; Structural Simulations in Ansys; Package warpage and solder joint reliability. • Hands-on: Bump and interconnect stress analysis; Reliability Studies in Ace+; Advanced material modeling for semiconductor-grade materials. • Electromagnetic-Thermal Coupling: Electromagnetic Interactions in Semiconductors; Current crowding, Joule heating, and eddy currents; Applications in high-frequency and power electronics; Electromagnetic Analysis Using Ansys; Ansys HFSS and Maxwell workflows for IC package design; Coupled Simulations; Integration of electromagnetic and thermal simulations.

	• Fluid Dynamics in Semiconductor Cooling; Cooling Solutions for Semiconductor Devices; Air-cooled and liquid-cooled systems; Microfluidics in semiconductor devices; CFD Simulations in Ace+; Flow modeling for liquid cooling; Design of cooling channels for 3D-ICs. • CFD in Ansys; Electronics cooling with Fluent. • Advanced Topics in Semiconductor Multiphysics: Multiphysics Challenges in Advanced Packaging; 3D ICs, SiP (System in Package), and TSVs (Through-Silicon Vias). • Quantum effects in nanoscale devices. • Process Simulation: Thermal-mechanical coupling during reflow soldering.

Year 1: Second Trimester	
Course Name	Automated equipment testing & Debugging
Credits	2
Learning Hours	60
Description	To provide students with a comprehensive understanding of automated testing and debugging techniques for semiconductor manufacturing equipment, enabling them to effectively ensure equipment performance, reliability, and quality in production environments.
Outcomes	• Understand Testing Fundamentals. • Identify Test Equipment used in semiconductor manufacturing. • Develop Testing Protocols. • Utilize Testing Software. • Apply systematic debugging techniques.
Content	• Fundamentals of Automated Testing and Debugging: Introduction to Automated Testing; Importance and applications in industrial equipment. Overview of test automation frameworks and systems. Debugging Basics; Role of debugging in the product lifecycle; Common approaches and tools. • Test Design and Strategies: Test Planning; Test case design for hardware and software systems. Functional, performance, and reliability testing. Automation Workflows; Setting up automated test environments; Frameworks and scripting basics (Python, LabVIEW, or other platforms). • Equipment Interfaces and Communication Protocols; Hardware-Software Interfaces; Communication standards: Serial, USB, Ethernet; Configuring test equipment with SCADA, PLCs, and HMIs; Protocols for Testing; Overview of Modbus, OPC UA, and other protocols. • Debugging Techniques for Automated Systems: Debugging Tools; Logic analyzers, oscilloscopes, and protocol analyzers; Software debuggers and error logging systems; Systematic Debugging; Techniques for isolating and resolving faults.

	• Integration of IoT and AI in Testing: IoT in Automated Testing; Cloud-based monitoring and control of test equipment; Remote diagnostics and predictive maintenance; AI and Machine Learning; AI-driven test optimization and anomaly detection. • Test Automation Frameworks and Tools: Automated Testing Frameworks; Overview of tools like Test Stand, Selenium (for software), and LabVIEW; Test script development and execution; Custom Solutions; Building custom test setups for unique equipment;

Year 1: Second Trimester	
Course Name	Software Coding & Fundamental of AI in Semiconductors (Python)
Credits	2
Learning Hours	60
Description	This module offers a structured exploration of Python programming, aimed at equipping participants with essential coding skills and fostering a deep understanding of practical applications.
Outcomes	• Understand Python programming with essential coding skills. • Will have a deep understanding of practical applications
Content	• Python Essentials for Semiconductor Applications: Python Fundamentals; Setting up the environment (Python, Jupyter Notebook/VS Code); Syntax, variables, and basic I/O operations. Control structures: loops and conditionals. Data Structures and Libraries; Lists, sets, dictionaries, and string manipulations; Introduction to NumPy for numerical operations and Pandas for data manipulation; Semiconductor Data Analysis and Visualization; Data cleaning and preprocessing specific to semiconductor datasets (e.g., wafer maps, equipment logs); Data visualization with Matplotlib and Seaborn to analyze yield and defect trends. • AI/ML Fundamentals for Semiconductor Manufacturing; Introduction to AI and ML in Semiconductors; Overview of AI/ML applications in semiconductor manufacturing; Case studies: Yield prediction, process control, and defect classification; Data Preparation and Feature Engineering; Techniques for data preprocessing and feature selection for semiconductor datasets; Handling large datasets from metrology and inspection tools; ML Algorithms and Predictive Analytics; Introduction to supervised and unsupervised learning algorithms; Practical: Implementing ML models (e.g., linear regression, clustering) for yield prediction using Scikit-learn; Anomaly Detection and Process Optimization; Techniques for detecting equipment anomalies and process deviations. • Hyperparameter tuning for model optimization. • Advanced AI Concepts for Semiconductor Applications; Computer Vision for Defect Detection; Applying AI for defect classification using wafer map

	datasets; Image processing with OpenCV and AI-based defect detection with TensorFlow/Keras. Real-time Analytics and Equipment Monitoring; Implementing AI for real-time data processing and fault prediction in fab equipment; IoT integration for monitoring tools like CVD, lithography, and etching systems; AI Governance, Ethics, and Future Trends in Semiconductors; Data privacy and security challenges in semiconductor fabs; Emerging trends: Digital twins, Industry 5.0, and quantum computing.

Year 1: Second Trimester	
Course Name	Reliability and Quality for Engineers
Credits	2
Learning Hours	60
Description	Reliability and Quality Control for Engineers is a comprehensive course that explores the principles, methodologies, and tools used to enhance the reliability and quality of engineering systems, products, and processes. The course equips students with the knowledge to assess and improve the performance, durability, and safety of engineering solutions across various industries.
Outcomes	• Probability and Statistical Analysis • Reliability Modelling and Prediction • Failure Modes and Effects Analysis • Quality Management Systems • Design for Reliability and Quality • Reliability Testing and Evaluation • Root Cause Analysis • Application of Reliability and Quality Principles • Case Studies and Industry Examples
Content	• Definition and importance of reliability in semiconductors: • Failure mechanisms and their impact on device performance • Common Semiconductor Failure Mechanisms Quality Assurance in Semiconductor Manufacturing • Quality control methodologies (Six Sigma, SPC) • Defect detection and control strategies • Yield enhancement techniques • Reliability Testing Methods • Packaging and Its Impact on Reliability • Statistical Process Control (SPC) in Semiconductor Manufacturing • Analyzing process variability and improving yield Design for Reliability (DfR) and Quality (DfQ); Implementing DfR and DfQ principles in product design • Reliability modeling and simulation techniques • Semiconductor Supply Chain Quality Management

	• Certification processes and their role in quality assurance • Case Studies in Reliability and Quality Improvement • Reliability testing simulations • Quality audits and SPC exercises

Year 1: Second Trimester	
Course Name	Advanced Packaging; Design & SMT
Credits	2
Learning Hours	60
Description	The course explores the design, manufacturing, and assembly of advanced packaging solutions for electronic devices, with a focus on Surface-Mount Technology (SMT). Students will learn about various packaging techniques such as chip-on-board (COB), system-in-package (SiP), and 3D packaging, alongside the principles of SMT design and assembly processes. The course emphasizes the integration of advanced packaging with smart manufacturing principles, such as automation and real-time monitoring, to improve performance, efficiency, and sustainability in modern electronics production.
Outcomes	Students will be able to understand and apply advanced packaging techniques and SMT processes, design and optimize packaging solutions for electronic devices, and integrate smart manufacturing technologies to enhance production efficiency and reliability. They will also gain the ability to address challenges related to performance, miniaturization, and sustainability in modern packaging and assembly environments.
Content	• An Overview, Miniaturization, MEMS and Microelectronics -3 levels of Packaging • Critical Issues viz., Interface, Testing & evaluation; Design aspects and Process Flow, Materials for Packaging, Top-down System Approach. • Different types of Sealing Technologies brazing, Electron Beam, and Laser welding. Vacuum Packaging with Moisture Control. • 3D Packaging examples. • Bio Chips / Lab-on-a chip and microfluidics, Various RF Packaging, Optical Packaging, and Packaging for Aerospace applications. • Advanced and Special Packaging techniques – Monolithic, Hybrid, etc., Transduction and Special packaging requirements for Absolute, Gauge and differential Pressure measurements, Temperature measurements, Accelerometer and Gyro packaging techniques, Environmental Protection and Safety Aspects in MEMS Packaging. • Reliability Analysis and FMECA.

	• Media Compatibility Modelling, Design, and Implementation, elastic waves and propagation, transducer modeling, MEMS sensors and actuator design, and RF MEMS component analysis. • Finite element modelling, layout design and device testing scheme of different MEMS transducers will be covered. • Introduction to Surface Mount Technology; Materials selection like solder paste, cleaning solvents etc., • Surface Mount components, packages, substrates etc., • Soldering of Surface Mount Assemblies using Dual wave and reflow soldering. • Inspection of Surface Mount assemblies • Rework and repair of Surface Mount Soldered joints

Year 1: Third Trimester	
Course Name	Industrial Safety for Semiconductors Manufacturing
Credits	2
Learning Hours	60
Description	The course focuses on the safety protocols and best practices necessary for working in semiconductor manufacturing environments. Students will learn about the potential hazards in semiconductor fabs, including chemical, electrical, and physical risks, and how to mitigate these through proper safety measures, personal protective equipment (PPE), and emergency response procedures. The course emphasizes the importance of maintaining safe and efficient operations in a cleanroom environment, adhering to industry safety standards, and integrating smart safety technologies in semiconductor production.
Outcomes	Students will be able to identify and manage safety hazards in semiconductor manufacturing environments, apply proper safety protocols, and use appropriate PPE. They will also understand emergency response procedures and be able to implement smart safety technologies to ensure a safe, compliant, and efficient workplace in semiconductor production.
Content	• Introduction to Industrial Safety • Hazchem Safety in Semiconductor Industry (safety in process industries) • Electric Safety in Semiconductor Manufacturing Industry, Semiconductor Factory Operations safety (safety in engineering industries) • Semiconductor Office Ergonomics & Environment, • Health & Safety (EHS), • Semiconductor Hazardous Energy Control, Safety Basics and Law, • Maintenance Engineering Basics, Wear and Corrosion and their prevention: • Periodic and preventive maintenance, Fault tracing, Safety Audits, First Responder Team Basics. ESG

Year 1: Third Trimester	
Course Name	Operational Excellence & Supply Chain Management
Credits	2
Learning Hours	60
Description	The course covers the principles and practices essential for optimizing manufacturing operations and managing supply chains in smart manufacturing environments. Students will learn about lean manufacturing, process improvement methodologies (such as Six Sigma), and supply chain strategies, with a focus on efficiency, cost reduction, and customer satisfaction. The course also explores the integration of smart technologies, real-time data, and automation in supply chain management to drive performance and sustainability in modern manufacturing systems.
Outcomes	Students will be able to apply operational excellence techniques to improve manufacturing processes, manage supply chains effectively, and use smart technologies to optimize performance. They will also be equipped to identify areas for process improvement, implement lean and Six Sigma methodologies, and enhance supply chain efficiency in a smart manufacturing context.
Content	• Introduction to Operational Excellence: Definition and Importance • Key Principles and Concepts; Historical Development and Evolution • Lean Management Lean Principles and Tools • Value Stream Mapping Waste Identification and Elimination Continuous Improvement (Kaizen) • Six Sigma Methodology DMAIC Process (Define, Measure, Analyze, Improve, Control) • Statistical Tools and Techniques Process Capability and Performance • Supply Chain Fundamentals Supply Chain Components and Functions • Supply Chain Flows (Product, Information, Financial) • Supply Chain Integration and Collaboration • Supply Chain Strategy and Design • Strategic Sourcing and Procurement • Network Design and Optimization Risk Management in Supply Chains • Inventory Management Inventory Types and Functions Inventory • Control Techniques Just-In-Time (JIT) and Kanban Systems • Logistics and Distribution • Transportation Management • Warehousing and Distribution Strategies • Global Logistics and Trade Compliance • Technology in Supply Chain Management Role of Information • Technology, Enterprise Resource Planning (ERP) Systems, Emerging Technologies (IoT, Blockchain, AI)

	• Performance Measurement and Improvement

Year 1: Third Trimester	
Course Name	Fundamentals of Project & Finance Management
Credits	2
Learning Hours	60
Description	The course introduces students to the core concepts, tools, and techniques required to effectively manage projects in a manufacturing environment. Topics include project planning, scheduling, risk management, budgeting, and resource allocation. Students will also learn about modern project management methodologies such as Agile and Waterfall, and how to apply them to manufacturing projects. The course emphasizes the importance of collaboration, communication, and leadership in ensuring the successful execution of projects within smart manufacturing systems.
Outcomes	Students will be able to plan, execute, and manage projects efficiently in a manufacturing context. They will understand project management principles, apply key tools for scheduling and budgeting, and manage project risks. Additionally, students will be equipped to lead project teams and implement modern methodologies to ensure successful project outcomes in smart manufacturing environments.
Content	• Introduction to Project Management • Definition and Importance of Project Management • Project Life Cycle (Initiation, Planning, Execution, Monitoring, Closure) • Roles and Responsibilities of a Project Manager • Project Planning and Scheduling • Work Breakdown Structure (WBS) • Gantt Charts and Network Diagrams • Critical Path Method (CPM) and Program Evaluation Review Technique (PERT) • Project Execution and Control • Resource Allocation and Management • Risk Management and Mitigation Strategies • Quality Assurance and Control • Introduction to Finance Management • Basic Financial Concepts and Terminology • Financial Statements (Balance Sheet, Income Statement, Cash Flow Statement) • Financial Ratios and Analysis • Budgeting and Financial Planning • Budget Preparation and Management • Forecasting Techniques

	• Cost Estimation and Control • Project Financial Management • Project Cost Management • Earned Value Management (EVM) • Financial Risk Management • Investment Analysis and Decision Making • Time Value of Money (TVM) • Net Present Value (NPV) and Internal Rate of Return (IRR) • Cost-Benefit Analysis • Performance Measurement and Reporting • Key Performance Indicators (KPIs) • Financial Reporting and Analysis • Project Performance Reviews • Technology in Project and Finance Management • Project Management Software Tools • Financial Management Systems • Emerging Technologies (AI, Blockchain)

Year 1: Third Trimester	
Course Name	Circular Economy and Sustainability in Semiconductor Manufacturing
Credits	2
Learning Hours	60
Description	The course focuses on integrating sustainability practices within semiconductor manufacturing. Students will explore the principles of circular economy, waste reduction, energy efficiency, and resource optimization in semiconductor production. The course covers strategies for minimizing environmental impact, recycling materials, and designing for sustainability throughout the semiconductor lifecycle. Emphasis is placed on the role of smart manufacturing technologies in driving eco-friendly practices and improving sustainability in the semiconductor industry.
Outcomes	Students will be able to apply circular economy principles to semiconductor manufacturing, develop strategies for reducing waste and energy consumption, and incorporate sustainable practices into production processes. They will also understand the role of smart technologies in enhancing sustainability and minimizing the environmental footprint of semiconductor manufacturing.
Content	• The circular economy concept and aspiration, Principles of Circular Economy:

	• Eliminate waste and pollution, Circulate products and materials (at their highest value), Process efficiency and Regenerate nature, Benefits and challenges in industrial contexts. • Life Cycle Assessment: Main phases of LCA: Goal and scope definition, Inventory analysis, Impact assessment, and Interpretation, LCA-related assessments. Standards for LCA in ISO 14040 and 14044, • Comparing LCA with other approaches: Cradle-to-cradle, Circular economy, Circularity economy strategies in Industrial processes, Resource Efficiency and Waste Minimization, • Recycling and Upcycling in Industrial Processes: Types of industrial recycling processes (e.g., closed-loop, open-loop), Upcycling and the creation of higher-value products from waste, Case Studies in Recycling and Upcycling, • Circular economy priorities: Design for Longevity, Resource Efficiency, Waste Reduction and Management, Circular economy strategies for materials, energy and water in industry • Renewable Energy Technologies/ Renewable Energy Solutions, Different types of renewables and their fundamentals. • Integration of renewable energy into electrical grids: Integration strategies and grid integration challenges of renewables, Industrial energy efficiencies • Energy audit: Simulation, Installation, Monitoring, GHG calculations, and Carbon credits, Industrial Decarbonization Pathways • Energy Conversion & Storage Systems

Year 1: Fourth Trimester	
Course Name	Capstone Project
Credits	10
Learning Hours	300
Description	The culmination of theoretical insights and practical skills, the industry internship offers students the opportunity to engage with real-world manufacturing scenarios. Under the guidance of experienced professionals, participants navigate the complexities of Industry 4.0 in action, contributing to projects that drive innovation and transformation
Outcomes	The internship serves as a bridge between academic learning and industrial practice, enabling students to apply their knowledge, collaborate with industry experts, and gain valuable insights into the intricacies of modern manufacturing. By immersing themselves in practical challenges, students refine their skillset, broaden their perspectives, and emerge as adept contributors to the industry 4.0 landscape.

Masters in Sustainable Engineering and Management

Semester Wise Pattern for Students admitted to Masters in Sustainable Engineering and Management				
Year	**First Trimester**	**Credits**	**Second Trimester**	**Credits**
1	Climate and SDGs	2	Industrial energy efficiency	2
	ESG: Managing Complex Social and Environmental Systems	2	Innovative Energy Strategies and Clean Energy Solutions	2
	Innovations in HSE	2	Grid Integration of renewables and Grid Optimization	2
	Designing innovation: Industrial Decarbonization	2	New pathways to Energy storage and management	2
	Redesign Finance (including Carbon Markets)	2	Sustainable energy Economics, Policies and Regulation	2
	Total Credits	**10**	**Total Credits**	**10**
Year	**Third Trimester**		**Fourth Trimester**	
1	The Circular Economy: Concepts, Recycling and Upcycling in Industry	2	Capstone Project	10
	Decision Analysis& systems Thinking: LCA, CBA	2		
	Industrial Water and Resources: Conservation & Recycling	2		
	Digital Urban Transformation: Sustainable Infrastructure, Circular economy	2		
	Sustainability Leadership	2		
	Total Credits	**10**	**Total Credits**	**10**
Year	**First Semester**		**Second Semester**	
2	Academic Pathway	20	Academic Pathway	20
	Total Credits	**20**	**Total Credits**	**20**

Total Credits per year is 40 and each credit corresponds to 30 learning hours.

Year 1: First Trimester	
Course Name	Climate and SDGs
Credits	2
Learning Hours	60
Description	Focuses on Sustainable development goals, and their role in climate change mitigation.

Outcomes	• Analyze climate-SDG linkages. • Evaluate policy effectiveness. • Propose solutions for climate challenges
Content	1. Aspects of Sustainability: Transition from MDGs to SDGs • Need for SDGs and Global Adoption • Understanding why the SDGs are necessary and their global acceptance. • Philosophy Behind the SDGs • Exploring the underlying principles and rationale driving the SDGs. • Framework and Structure of the Seventeen SDGs • Detailed breakdown of the SDGs and their organization. 2. Categorization of SDGs • People-Centric Goals (SDG 1 - 10) • Ecological Goals (SDG 11 - 15) • Spiritual Goals (SDG 16 - 17) 3. Economic, Societal, and Biosphere SDGs • Economic SDGs: 8 (Decent Work and Economic Growth), 9 (Industry, Innovation, and Infrastructure), 10 (Reduced Inequalities), 12 (Responsible Consumption and Production). • Societal SDGs: 1 (No Poverty), 2 (Zero Hunger), 3 (Good Health and Well-being), 4 (Quality Education), 5 (Gender Equality), 7 (Affordable and Clean Energy), 11 (Sustainable Cities and Communities), 16 (Peace, Justice, and Strong Institutions). • Biosphere SDGs: 6 (Clean Water and Sanitation), 13 (Climate Action), 14 (Life Below Water), 15 (Life on Land). 4. Case Studies • Examples from both international and national contexts. 5. Implementation in India • Nodal Agency for Implementation: Identifying the primary body responsible for SDG execution in India. • State-Level Reports: Review of progress and reports at the state level. • Assessment of Implementation: Evaluating the effectiveness of SDG implementation

Year 1: First Trimester	
Course Name	ESG: Managing Complex Social and Environmental Systems
Credits	2
Learning Hours	60
Description	Examines the impact of corporate practices on sustainability and ethical governance. Includes understanding of frameworks in India, Europe etc.
Outcomes	• Understand ESG principles.

	• Analyze sustainability impacts. • Develop ESG strategies
Content	• ESG Policies • ESG frameworks • Alignment of different ESG standards • IFRS 1 - General Disclosures • IFRS 2 - Climate-Related Disclosures • Global Reporting Initiative (GRI) • Sustainability Accounting Standards Board (SASB) • Business Responsibility & Sustainability Reporting (BRSR) • ESG materiality assessment: assessing material issue to industry, engage stakeholder to assess the materials. • ESG ratings • Dow Jones Sustainability Index (DJSI) assessment • Morgan Stanley Capital International • Sustainalytics • Others • Metrics: Environmental, Energy & Governance • Measurement: Data collection (automated systems, surveys, audits) • Environmental: Water, energy efficiency, carbon intensity, EMS

Year 1: First Trimester	
Course Name	Innovations in HSE
Credits	2
Learning Hours	60
Description	Explores cutting-edge practices and technologies in HSE management.
Outcomes	• Conduct risk assessments • Develop an HSE management strategy
Content	• Qualitative study of HSE system • HSE MS-Process safety, Personal Safety, Occupational health, Environment • Industry Environment • Baseline risk assessment • Documents/guideline • KPIs selection, rating and evaluation criteria • Leading indicators: safety training completion rates, near-miss reporting rates, or safety audit compliance rates. • Lagging indicators: Total Recordable Incident Rate (TRIR), Lost Time Injury Frequency Rate (LTIFR), or Injury Severity Rate. • Selection, Weighing, and rating of KPIs. • Determining minimum acceptable level (MAL) or KPIs evaluation criteria

	• Quantification of HSE performance • KPI score recording • Aggregation • Computation & evaluation of HSE lead index, lag index, and total index • Methodologies in risk analysis: • HAZOP - threat analysis and operational capabilities • ETA - event tree analysis • FMEA - analysis of the types and effects of possible errors • FTA - Fault Tree Analysis • LOPA - analysis of security layers • PHA - Initial Hazard Analysis • QRA - Quantitative Risk Assessment • Mitigation measure • Administrative Control • Engineering Controls • Personal Protective Equipment

Year 1: First Trimester	
Course Name	Designing innovation: Industrial Decarbonization
Credits	2
Learning Hours	60
Description	Investigates strategies for reducing carbon emissions in industrial sectors and the functioning of carbon markets.
Outcomes	• Analyze decarbonization strategies. • Evaluate carbon market impacts. • Develop industry-specific carbon reduction plans
Content	**Sustainability essentials** • Reduce, Reuse, Recycle, Energy Efficiency, Sustainable Transportation, Conserve Water, Support Local, Sustainable Food Choices, Eco-friendly Products, Biodiversity Protection, Educate and Advocate **Industrial Decarbonization:** • GHGs, GHG Inventory Development Resources • Standards and Guidelines (GHG Protocol, ISO 14064 Standards) • Energy policies in the context of decarbonization • Industrial Process carbon emissions • Emission Sources and Calculation Methods • Identifying Emission Sources (Scope 1, Scope 2, and Scope 3 emissions) • Calculation Methods**:** Emission factors, Activity data and their collection, Tools and software for calculations **Science based Target Initiatives (SBTi) decarbonization.**

	• **Key Decarbonization Pathways**: Energy Efficiency Improvements, Switching to Low-Carbon Energy Sources, Electrification of Processes, Carbon Capture, Utilization, and Storage (CCUS), Sustainable Feedstocks • **Sector-Specific Strategies**: Cement and concrete, Steel, Chemical etc.

Year 1: First Trimester	
Course Name	Redesign Finance (including Carbon Markets)
Credits	2
Learning Hours	60
Description	Investigates the mechanisms of carbon markets and the use of offsets in achieving emission reduction goals.
Outcomes	• Evaluate carbon market structures. • Design and assess offset projects. • Analyze the effectiveness of carbon trading systems
Content	• Carbon Emissions in Industry • Major Sources of Industrial Carbon Emissions • Industry-Specific Emission Profiles (Manufacturing, Mining, Construction, etc.) • Regulatory Landscape and Compliance Requirements • Roadmap for achieving India's Nationally Determined • Contribution (NDCs) through forestry sector • Policy and regulatory framework for mitigating climate change through Forestry • Future of the Carbon Market in India • Geoinformatics: Forests and Climate Change • Geospatial Tools and Data Requirements: for Development of Carbon Finance • 5 pools of Carbon in Terrestrial and Wetland Ecosystems • Carbon Finance Projects for Mangrove Ecosystem through ARR; A Case Study of Sundarbans Tiger Reserve (STR) • Biomass measurements for carbon stock assessment • Application of GPS, Layout of permanent sample plot and measurement of 5 pools of carbon - AGB, BGB, Deadwood, Leaf litter and SOC. • Carbon Finance Mechanism through Afforestation, Reforestation and Revegetation (ARR) • Biodiversity Conservation in mitigating Climate change • Potential of Carbon Finance and scenario of Carbon Markets

Year 1: Second Trimester	
Course Name	Industrial energy efficiency

Credits	2
Learning Hours	60
Description	Focuses on optimizing energy use in industrial processes to reduce costs and emissions.
Outcomes	• Conduct energy audits • Propose efficiency improvements. • Implement energy management systems
Content	**Energy audit** • About Energy Audit • Types of Energy Audit: Preliminary and Detailed Audit, Visible Energy loss identification in walk through audit, Energy Audit criteria, Scope of energy Audit, Selection of Audit team Energy Audit Plan • Phase 1 (Preparation of Energy Audit): Initial walk through, collecting energy bills and data, Conducting preliminary analysis, Sample Energy flow charts. • Phase 2 (Execution of Energy Audit): Data inventory and management, Graphical representation of data, Analyzing Energy use pattern, Bench-marking and comparative analysis, Identifying Energy Saving Potential, Cost benefit analysis. • Phase 3 (Reporting of Energy Audit): Preparing Energy Audit Report with Recommendations, Preparing Action Plan, Implementing the action plan, Sample audit report. • ISO 50001 and Energy Management Case Studies: ISO 50001, Plan Do Check Act of ISO 50001, Comparison of ISO 14001 and ISO 50001, Features of ISO 50001, Case Studies of Pumping system, chemical, automobile and textile plant and steel company. **Industrial energy efficiency** • Energy Planning • Demand-side Management and Energy Efficiency • Urban Energy planning a. Land use and Transport Planning b. Site Planning and Building Design c. Infrastructure Efficiency Strategies d. Alternative Energy Supply

Year 1: Second Trimester	
Course Name	Innovative Energy Strategies and Clean Energy Solutions
Credits	2
Learning Hours	60
Description	This course offers an in-depth exploration of clean energy solution and energy storage systems. It covers the core principles behind various renewable energy sources, including thermal, solar, wind, hydropower,

	biomass, and geothermal. In addition, the course delves into advanced energy storage solutions, such as innovative materials and devices, hydrogen storage techniques, and the integration of these technologies into modern electrical grids. Participants will gain hands-on knowledge of the latest advancements and strategies for improving energy efficiency and promoting sustainability
Outcomes	• Assess the benefits, limitations, and applications of various renewable energy technologies. • Understand the operation, advantages, and challenges of each type of energy storage technology. • Develop strategies for effective integration of energy storage technologies to enhance grid stability and energy management
Content	• Different types of renewables and their fundamentals • Solar Energy Technologies: PV, Solar thermal • Wind Energy Technologies: Wind turbine, Offshore • Hydropower Technologies: Hydroelectric power plants, Tidal and wave energy • Biomass Energy Technologies: Biomass power generation, Biofuels • Geothermal Energy Technologies: Geothermal Power Generation, Geothermal Heat Pumps • Hydrogen Energy Technologies: Electrolysis, fuel cells • Maximum power point operation of renewable Storage technologies associated with renewables Islanded operation of renewables. • Grid integration challenges of renewables • Other energy saving technologies: Ground Source Heat Pump (GSHP), Underground Thermal Energy Storage (UTES), Combined Heat and Power (CHP), tri generation, fuel cell, light pipe

Year 1: Second Trimester	
Course Name	Grid Integration of renewables and Grid Optimization
Credits	2
Learning Hours	60
Description	Introduces the challenges and solutions for integrating renewable energy into existing grids with emphasis on India.
Outcomes	• Evaluate grid integration techniques. • Design integration strategies • Understand grid management
Content	• Key Components of Smart Grids: Advanced Metering Infrastructure (AMI), Communication Technologies, Distribution Automation, Demand Response, Energy Storage Systems • Role of Smart Grid: Peak load management and demand response Grid Integration of Renewable • Smart Grid and Quality of Supply and Service (QoSS) Smart Grid Communication Systems

	• Grid Integration of Renewables, Role of Smart Grid Business Models for smart grid applications • Communication Technologies and Cybersecurity: Communication protocols and network design, Cybersecurity risks and mitigation strategies. • Integration of Renewable Energy and Distributed Generation: Challenges and solutions for integrating renewables, Management of distributed energy resources (DERs). • Policy and Regulatory Considerations in Smart Grid • Cost benefits/economics and tariffs of smart microgrids: Cost benefits regarding microgrids, Hybrid microgrids

Year 1: Second Trimester	
Course Name	New pathways to Energy storage and management
Credits	2
Learning Hours	60
Description	Explores innovative technologies and strategies for energy storage and management systems.
Outcomes	• Develop energy models. • Analyze system performance. • Apply modeling to real-world scenarios
Content	• Energy Conversion & Storage Systems • Batteries, components of batteries, Battery Configuration & Fabrication • Supercapacitors • Thermal Energy Storage • Pumped-hydro Energy Storage • Fuel cells

Year 1: Second Trimester	
Course Name	Sustainable energy Economics, Policies and Regulation
Credits	2
Learning Hours	60
Description	Examines the economic principles, policy frameworks, and regulatory mechanisms governing sustainable energy.
Outcomes	• Analyze energy market economics. • Develop policy recommendations for sustainability. • Assess regulatory impacts on energy transition

Content	1. Economic Principles in Energy: Supply and demand dynamics in energy markets, capital, operational, and maintenance costs of renewable energy technologies.
	2. Cost-Benefit Analysis
	  • Evaluating the economic feasibility of energy projects.
	  • Techniques for calculating net present value (NPV), internal rate of return (IRR), and payback periods.

	3. Financing Sustainable Energy Projects • Sources of funding: government grants, private investment, and public-private partnerships. • Financial instruments: green bonds, loans, and equity financing. 4. Market Structures and Pricing • How energy markets operate: spot markets, futures markets, and power purchase agreements (PPAs). • Pricing mechanisms for renewable energy: feed-in tariffs, tax credits, and subsidies

Year 1: Third Trimester	
Course Name	The Circular Economy: Concepts, Recycling and Upcycling in Industry
Credits	2
Learning Hours	60
Description	Explores the principles and objectives of the circular economy in promoting sustainability.
Outcomes	• Articulate the vision of a circular economy. • Evaluate circular economy strategies. • Propose innovative business models
Content	• Principles of Circular Economy: Eliminate waste and pollution, Circulate products and materials (at their highest value), Process efficiency and Regenerate nature • Benefits and challenges in industrial contexts • Types of industrial recycling processes (e.g., closed-loop, open-loop), Upcycling and the creation of higher-value products from waste. • Case Studies in Recycling and Upcycling

Year 1: Third Trimester	
Course Name	Decision Analysis & systems Thinking: LCA, CBA
Credits	2
Learning Hours	60
Description	Analyzes the environmental impacts of products and processes throughout their life cycle.
Outcomes	• Develop thermal energy models. • Simulate system performance. • Evaluate digitalization impacts
Content	• Main phases of LCA: Goal and scope definition, Inventory analysis, Impact assessment, and Interpretation • LCA-related assessments: • Standards for LCA in ISO 14040 and 14044 • Comparing LCA with other approaches: Cradle-to-cradle, Circular economy

Year 1: Third Trimester	
Course Name	Industrial Water and Resources: Conservation & Recycling
Credits	2
Learning Hours	60
Description	Focuses on strategies for conserving and recycling water and resources in industrial processes
Outcomes	• Develop water conservation strategies. • Implement resource recycling initiatives. • Evaluate compliance with sustainability standards
Content	1. Introduction to Industrial Water Management (IWM), Water Sourcing, and Supply Systems 2. Water Treatment Needs and Management (6 hours) • Water Treatment Requirements for Industrial Applications • Advanced Treatment Technologies • Wastewater Infrastructure • Wastewater Reuse and Zero Liquid Discharge (ZLD) 3. Water Recycling and Reuse in Industry (4 hours) • Industrial Water Recycling Systems • Examining the process and systems for water recycling in industrial settings. • Case Studies of Water Reuse in Various Industries: Review of water reuse in industries such as thermal power plants, textiles, pharmaceuticals, tanneries, chemicals, pulp and paper, food processing, steel, sugar, and fertilizers. • Implementing Water Recycling Infrastructure 4. Sustainable Industrial Water Management Practices (6 hours) • Principles of Water Conservation and Efficiency • Circular Water Management and Closed-Loop Systems • Emerging Technologies for Water Management • Utilizing IoT, AI-driven optimization, and other technologies for sustainable water management. • Infrastructure Maintenance and Asset Management 5. Regulatory and Policy Framework (4 hours) • Compliance and Reporting for Industrial Water Use. • Environmental Impact Assessment (EIA) and Environmental Impact Statement (EIS) 6. Case Studies in Corporate Water Stewardship

Year 1: Third Trimester	
Course Name	Digital Urban Transformation: Sustainable Infrastructure, Circular economy etc.
Credits	2
Learning Hours	60

Description	Explores the role of digital technologies in promoting sustainable urban development and circular economy practices.
Outcomes	• Analyze digital transformation impacts on urban sustainability. • Design smart infrastructure solutions • Assess circular economy integration in urban planning
Content	• Introduction to Data Mining, Data Analysis, Digitalisation, AI & ML for sustainability, circularity and sustainable energy • GIS, remote sensing in planning, feasibility assessment, development, implementation, and management of energy systems • Machine Learning for energy systems and optimization in power systems • Mathematical programming, energy modelling, and energy economics • Distributed energy technologies, modelling, and control • Digitalization of Thermal Energy Technologies – Modelling and Simulation Method • Automation, Sensor Technologies, Data Analytics, & AI for Non-Destructive Diagnostics and Asset Management.

Year 1: Third Trimester	
Course Name	Sustainability Leadership
Credits	2
Learning Hours	60
Description	This course is designed to equip participants with the knowledge, skills, and mindset necessary to lead sustainable practices within organizations, communities, and industries. The focus is on fostering a deep understanding of sustainability principles, strategic leadership, and decision-making processes that promote environmental stewardship, social responsibility, and economic resilience. Students will explore global sustainability challenges, leadership models, and the role of innovation in creating sustainable solutions. Emphasis will be placed on systems thinking, ethical leadership, and the integration of sustainability into organizational strategies and operations.
Outcomes	• Understanding of key sustainability concepts, frameworks (e.g., triple bottom line, circular economy), and global sustainability challenges. • Understand how to integrate sustainability principles into business strategies, operations, and decision-making processes. • Learn to assess and measure the environmental, social, and economic impacts of organizational decisions, products, and services. • Understand the ethical implications of business decisions and the role of leadership in promoting corporate social responsibility (CSR).
Content	• Defining sustainability in the context of leadership. • Global Sustainability Challenges and Opportunities • Leadership Models for Sustainability

	• Strategic Integration of Sustainability • Ethics, Corporate Social Responsibility (CSR), and Governance

Year 1: Fourth Trimester	
Course Name	Capstone Project
Credits	10
Learning Hours	300
Description	The culmination of theoretical insights and practical skills, the industry internship offers students the opportunity to engage with real-world manufacturing scenarios. Under the guidance of experienced professionals, participants navigate the complexities of Industry 4.0 in action, contributing to projects that drive innovation and transformation
Outcomes	The internship serves as a bridge between academic learning and industrial practice, enabling students to apply their knowledge, collaborate with industry experts, and gain valuable insights into the intricacies of modern manufacturing. By immersing themselves in practical challenges, students refine their skillset, broaden their perspectives, and emerge as adept contributors to the industry 4.0 landscape.

Masters in Robotics Engineering and Management

Semester Wise Pattern for Students admitted to Masters in Robotics Engineering and Management				
Year	**First Trimester**	**Credits**	**Second Trimester**	**Credits**
1	Semiconductor Backend Processing Fundamentals	2	Multiphysics Modelling (Ace+/ANSYS)	2
	Materials Engineering & Characterization	2	Automated equipment testing & Debugging	2
	Semiconductor Fabrication Technology & Process fundamentals	2	Software Coding & Fundamental of AI in Semiconductors (Python)	2
	Fundamentals of Semiconductor Devices	2	Reliability and Quality for Engineers	2
	Optoelectronics and photovoltaic devices	2	Advanced Packaging; Design & SMT	2
	Total Credits	**10**	**Total Credits**	**10**
Year	**Third Trimester**		**Fourth Trimester**	
1	Industrial Safety for Semiconductors Manufacturing	2	Capstone Project	
	Operational Excellence & Supply Chain Management	2		
	Fundamentals of Project & Finance Management	2		
	Circular Economy and Sustainability in Semiconductor Manufacturing	2		
	Elective	2		
	Total Credits	**10**	**Total Credits**	**10**
Year	**First Semester**		**Second Semester**	
2	Academic Pathway	20	Academic Pathway	20
	Total Credits	**20**	**Total Credits**	**20**

Total Credits per year is 40 and each credit corresponds to 30 learning hours.

Year 1: First Trimester	
Course Name	Robotic Manipulation, Estimation and Control
Credits	2
Learning Hours	60
Description	This course introduces the fundamentals of robotic manipulation, estimation, and control in the context of smart manufacturing. The course covers key

	concepts related to the operation of robotic systems, including motion control, kinematics, dynamics, and the application of estimation techniques for precise task execution. Students will explore advanced methods in robotic control and manipulation, such as model-based approaches, sensor integration, and real-time feedback loops, while understanding the role of robots in modern manufacturing environments. Emphasis will be placed on practical applications, including industrial robots and autonomous systems for material handling, assembly, and precision tasks
Outcomes	• Demonstrate a solid understanding of robotic kinematics, dynamics, and control strategies. • Apply techniques for robotic manipulation, including inverse kinematics and trajectory planning. • Implement robotic control algorithms to ensure precise manipulation and task execution. • Analyze and implement sensor fusion methods for accurate state estimation in robotic systems. • Design and simulate robotic control systems for practical applications in smart manufacturing. • Evaluate the performance of robotic systems in real-world environments using estimation and control techniques
Content	**Introduction to Robotics and Manipulation** • Overview of robotics in smart manufacturing. • Types of industrial robots (articulated, Cartesian, SCARA, etc.). • Robotic manipulation and its applications in manufacturing. • Robot workspaces, degrees of freedom, and grasping strategies. • Basic principles of robotic kinematics: forward and inverse kinematics. **Robotic Control Systems** • Fundamentals of control systems in robotics. • Motion control in robots: trajectory planning and execution. • Control techniques: Proportional-Integral-Derivative (PID) control, Model Predictive Control (MPC), and adaptive control. • Feedback and feedforward control strategies. • Stability and performance analysis of robotic systems. **Sensor Integration and Estimation Techniques** • Types of sensors used in robotic systems (encoders, force sensors, vision systems, etc.). • Sensor fusion techniques for state estimation. • Kalman filtering and extended Kalman filters (EKF) for real-time estimation. • Position and velocity estimation using sensors. • Practical applications of estimation techniques in manufacturing robots. **Advanced Robotic Manipulation Techniques**

	• Dynamic modeling of robotic manipulators. • Inverse dynamics and control. • Grasping, pick-and-place operations, and end-effector design. • Multi-robot coordination and collaborative manipulation. • Motion planning for manipulation tasks. **Applications in Smart Manufacturing** • Robotics in automation and precision manufacturing. • Role of robots in assembly lines, material handling, and inspection. • Industry 4.0 and the integration of robots with IoT, AI, and big data. • Case studies on the use of robotic systems for intelligent manufacturing tasks • Hands-on exercises in robot programming and motion control using simulation tools (e.g., VREP, Gazebo, or MATLAB/Simulink). • Application of estimation algorithms in real-time robot control tasks. • Practical demonstration of sensor integration and robotic manipulation.

Year 1: First Trimester	
Course Name	Systems Engineering and Management for Robotics
Credits	2
Learning Hours	60
Description	This course provides an in-depth understanding of systems engineering and management principles tailored for robotics applications in smart manufacturing. Students will explore how to design, integrate, and manage complex robotic systems and automation solutions within manufacturing environments. The course covers essential aspects of systems thinking, project management, lifecycle management, and the tools used for modeling, simulation, and optimization of robotic systems. Emphasis will be placed on the importance of coordinating multidisciplinary teams, managing risks, and ensuring the efficiency and scalability of robotic systems within modern manufacturing practices
Outcomes	• Demonstrate an understanding of systems engineering principles in the context of robotics. • Design and integrate robotic systems considering the entire lifecycle, from concept through operation and decommissioning. • Apply systems modeling and simulation tools to improve the design and performance of robotic systems. • Manage robotic system projects, including planning, risk analysis, and performance monitoring. • Evaluate and optimize robotic systems for efficiency, cost-effectiveness, and scalability in manufacturing environments. • Communicate effectively within multidisciplinary teams and coordinate various components of a robotics project.

Content	**Introduction to Systems Engineering** • Overview of systems engineering in robotics. • Key concepts of systems thinking and lifecycle management. • Systems engineering process: requirements analysis, design, integration, testing, and deployment. • Tools and methodologies used in systems engineering. • Overview of the role of robotics in smart manufacturing. **Robotics System Design and Integration** • System-level design of robotic solutions for manufacturing. • Design considerations: hardware, software, and human-robot interaction. • Integrating sensors, actuators, controllers, and communication systems. • Robotics system modeling and analysis: block diagrams, flowcharts, and system-level simulation tools. • Communication protocols and standards for robotics integration (e.g., ROS, OPC-UA). **Robotics Project Management** • Principles of project management in robotics. • Project lifecycle management: planning, execution, and closure. • Cost estimation, budgeting, and resource allocation for robotics projects. • Risk management: identifying, assessing, and mitigating risks in robotics projects. • Scheduling techniques (e.g., Gantt charts, Critical Path Method). • Team collaboration and leadership in multidisciplinary teams. **Simulation and Optimization of Robotic Systems** • Introduction to simulation tools for robotic systems (e.g., MATLAB, Simulink, or V-REP). • Modeling and simulating robotic systems to predict performance and optimize designs. • Optimization methods for improving robotic efficiency, reliability, and scalability. • Case studies on simulation and optimization in manufacturing environments. • Evaluating the performance of robotic systems through simulation data. **Sustainability and Scalability in Robotics** • Design considerations for scalable robotic systems in manufacturing. • Sustainability in robotic systems: energy efficiency, lifecycle analysis, and environmental impact. • Future trends in robotics and smart manufacturing (e.g., AI, machine learning, IoT integration). • Economic and practical considerations in scaling robotic systems.

	• Analysis of real-world case studies in robotics project management for smart manufacturing. • Lessons learned from successful robotic integration in manufacturing.

Year 1: First Trimester	
Course Name	Robot Mobility on Air, Land and Sea
Credits	2
Learning Hours	60
Description	This course explores the mobility principles and technologies that enable robots to operate across different environments: air, land, and sea. Students will learn about the diverse types of robots used in these domains, including aerial drones, ground robots, and underwater robots. The course covers the key principles of mobility, including locomotion systems, control strategies, and the challenges associated with each environment. Emphasis will be placed on the integration of sensors, actuators, and control systems that allow robots to navigate and perform tasks in dynamic and often challenging conditions, all within the context of smart manufacturing applications. By the end of the course, students will understand how these robots can be utilized for manufacturing, inspection, maintenance, and other industrial tasks
Outcomes	• Identify and explain the principles of robot mobility on air, land, and sea. • Understand the design and mechanical systems of aerial, land, and marine robots. • Implement navigation and control strategies suited to different mobility environments. • Analyze the challenges involved in designing and operating robots in these diverse domains. • Evaluate the use of robots in industrial applications such as inspections, maintenance, and monitoring across air, land, and sea. • Integrate mobility systems into smart manufacturing environments, including automation and data collection
Content	**Introduction to Robot Mobility** • Overview of robot mobility across different environments. • Importance of mobility in smart manufacturing and industry applications. • Types of robots: aerial (drones), land (ground vehicles), and sea (underwater robots). • Key principles: locomotion, control, sensing, and navigation. • Mobility challenges in different environments. **Aerial Robots – Drones** • Types of aerial robots: fixed-wing, multi-rotor, and hybrid designs. • Aerodynamics and principles of flight.

	• Control systems for aerial robots (PID control, stabilization, and path planning). • Sensor integration for navigation (GPS, IMU, vision systems). • Applications of drones in smart manufacturing: inventory management, inspection, monitoring, and delivery. • Challenges: weather, battery life, payload limitations, and communication. **Land Robots – Ground Vehicles** • Types of land-based robots: wheeled robots, tracked robots, and legged robots. • Locomotion principles: wheels, tracks, and legs. • Control and navigation techniques: path planning, obstacle avoidance, and SLAM (Simultaneous Localization and Mapping). • Sensors used in land robots: LIDAR, cameras, IMUs, and proximity sensors. • Applications of ground robots in smart manufacturing: material handling, assembly line operations, and warehouse management. • Challenges: terrain variability, stability, and energy efficiency. **Marine Robots – Underwater Robots** • Types of marine robots: Autonomous Underwater Vehicles (AUVs), Remotely Operated Vehicles (ROVs). • Principles of underwater navigation and control. • Challenges in marine robotics: buoyancy, pressure, and limited communication. • Sensors for underwater robots: sonar, cameras, depth sensors, and pressure sensors. • Applications of underwater robots in manufacturing: underwater inspection, pipeline monitoring, and data collection. **Control and Navigation Systems** • Overview of control strategies for robots on air, land, and sea. • Autonomous navigation: GPS-based, vision-based, and sensor fusion techniques. • Path planning and obstacle avoidance algorithms (A*, D*, RRT). • Multi-modal robots: Combining mobility across multiple environments. • Real-time control systems and integration with smart manufacturing networks. **Applications in Smart Manufacturing** • Integration of aerial, land, and marine robots into smart manufacturing systems. • Use of robots for remote monitoring, maintenance, inspection, and automation in industrial environments.

	• Case studies: Drones for inventory tracking, autonomous ground vehicles for material handling, and marine robots for industrial monitoring. • Future trends and challenges in robot mobility for smart manufacturing.

Year 1: First Trimester	
Course Name	Computer Vision for Robotics
Credits	2
Learning Hours	60
Description	This course focuses on the integration of computer vision techniques in robotics to enhance automated processes in smart manufacturing environments. Students will learn how robots can "see" and process visual information to interpret and interact with their surroundings. The course covers fundamental image processing, object recognition, 3D visions, and real-time vision systems, along with the application of these technologies in robotic systems for tasks such as inspection, navigation, and manipulation. By the end of the course, students will gain hands-on experience with key computer vision tools and algorithms, as well as an understanding of their practical applications in industrial automation
Outcomes	• Apply fundamental image processing techniques to prepare visual data for robotics applications. • Implement object detection and recognition algorithms in robotic systems for real-time tasks. • Utilize computer vision for robot navigation and manipulation in industrial environments. • Integrate 3D vision and stereo vision techniques for enhanced robot perception. • Understand the practical applications and challenges of computer vision in smart manufacturing. • Use industry-standard software tools for computer vision tasks and robotic control
Content	**Introduction to Computer Vision for Robotics** • Overview of computer vision and its role in robotics. • Key components of a robotic vision system: cameras, sensors, and processing units. • Image formation: Cameras, lenses, and the basics of image capture. • Relationship between vision and robotics: Perception, action, and feedback loops. • Applications of computer vision in manufacturing and automation. **Image Processing Fundamentals** • Image pre-processing: Noise reduction, image enhancement, and filtering techniques.

	• Color models and image representation (RGB, HSV, grayscale). • Edge detection techniques: Sobel, Canny, and Laplacian of Gaussian. • Image segmentation: Thresholding, region-growing, and contour detection. • Feature extraction: Key points, descriptors, and image matching. **Object Detection and Recognition** • Introduction to object detection: Techniques and algorithms (e.g., template matching, feature-based methods). • Machine learning methods for object recognition (SIFT, SURF, ORB). • Deep learning-based approaches: Convolutional Neural Networks (CNNs) for object detection. • Real-time object tracking: Kalman filter, mean-shift, and particle filter techniques. • Applications: Quality control, sorting, and pick-and-place operations in manufacturing. **3D Vision and Depth Perception** • Introduction to 3D vision: Stereo vision and depth maps. • Depth estimation: Triangulation, depth from disparity. • 3D reconstruction and point cloud generation. • Techniques for 3D object recognition and manipulation. • Integration of 3D vision with robotic arms and grippers for precision tasks. **Vision-based Robot Navigation** • Camera calibration and camera models for robotics. • Visual odometry: Estimating motion through visual cues. • Simultaneous Localization and Mapping (SLAM) with vision systems. • Feature tracking and matching for robot localization. • Applications in autonomous robots: warehouse robots, AGVs, and drones. **Real-Time Vision Systems and Applications** • Real-time image processing and the challenges of latency and performance. • Vision-based control: Feedback control systems using vision for manipulation and guidance. • Case studies: Application of computer vision in industrial robotics for quality inspection, assembly, and packaging. • Integration with other sensors and robotic systems for complete automation solutions. • Hands-on experience using software tools such as OpenCV, MATLAB, or ROS for computer vision and robotics integration. • Lab exercises to implement object detection, recognition, and tracking algorithms.

	• Simulated tasks where students will design vision-based control systems for robotic manipulation or navigation.

Year 1: First Trimester	
Course Name	Project Management
Credits	2
Learning Hours	60
Description	This course introduces students to the principles and practices of project management specifically tailored for robotics projects in the context of smart manufacturing. It covers the entire project lifecycle from planning and initiation to execution, monitoring, and closure. Students will learn how to manage multidisciplinary teams, assess risks, allocate resources, and manage budgets effectively while ensuring the successful integration of robotics technologies into manufacturing systems. The course emphasizes methodologies, tools, and strategies that are crucial for delivering robotics projects on time, within scope, and within budget
Outcomes	• Understand the fundamentals of project management and its application in robotics projects. • Apply project management processes (initiation, planning, execution, monitoring, and closing) to robotics projects. • Develop project schedules, budgets, and resource allocation plans for robotics integration in manufacturing. • Identify and manage risks associated with robotics projects. • Effectively communicate project status, issues, and deliverables to stakeholders. • Lead and collaborate with multidisciplinary teams to ensure the successful completion of robotics projects.
Content	**Introduction to Project Management in Robotics** • Overview of project management concepts and methodologies. • The role of robotics in smart manufacturing and industrial automation. • Key components of a robotics project: scope, goals, stakeholders, and deliverables. • Understanding the project lifecycle: initiation, planning, execution, monitoring, and closure. Also, project management standards and best practices for robotics. **Project Planning and Scope Management** • Defining project goals and objectives for robotics projects. • Creating project scope documents: defining requirements and deliverables. • Work breakdown structure (WBS) for robotics projects. • Estimating project timelines and setting milestones.

	• Developing a project plan: roles, responsibilities, and timelines. **Scheduling, Budgeting, and Resource Allocation** • Project scheduling tools: Gantt charts, Critical Path Method (CPM), and PERT diagrams. • Budgeting techniques for robotics projects: cost estimation and control. • Resource management: human, technical, and financial resources. • Tools for tracking project progress and resource utilization. • Time and cost management techniques for optimizing project performance. **Risk Management in Robotics Projects** • Identifying potential risks in robotics projects (technical, operational, and financial). • Risk assessment and analysis techniques: qualitative and quantitative methods. • Risk mitigation strategies: contingency planning and problem-solving. • Monitoring and controlling project risks throughout the lifecycle. • Case studies of successful and failed robotics projects due to risk management practices. **Team Management and Stakeholder Communication** • Managing cross-functional teams in robotics projects: engineers, designers, software developers, and operators. • Leadership and communication skills for robotics project managers. • Handling conflicts and ensuring collaboration in multidisciplinary teams. • Strategies for effective stakeholder engagement and communication. • Reporting project status, issues, and successes to stakeholders and sponsors. **Closing and Evaluating Robotics Projects** • Delivering project outcomes: testing, validation, and final deployment. • Conducting post-project evaluations: lessons learned, performance reviews. • Closing out the project: final documentation, knowledge transfer, and team debrief. • Continuous improvement in robotics project management. • Case study: Review of a completed robotics project (successes and challenges). • Hands-on project planning using software tools such as Microsoft Project or GanttPRO. • Group exercise: Develop a project plan for a hypothetical robotics integration project in a smart manufacturing scenario. • Case study presentations: Analyze real-world robotics projects and discuss how project management principles were applied (or missed) in those projects.

Year 1: Second Trimester	
Course Name	Robot Autonomy
Credits	2
Learning Hours	60
Description	This course provides an introduction to the key concepts and technologies involved in the autonomy of robots, with a particular focus on their applications in smart manufacturing environments. Students will explore the fundamentals of robot autonomy, including perception, decision-making, path planning, and control strategies that enable robots to operate autonomously in dynamic, unstructured environments. The course will cover the integration of sensors, artificial intelligence, and machine learning techniques that allow robots to sense their surroundings, make decisions, and perform tasks without human intervention. Practical applications of robot autonomy in smart manufacturing, such as automated inspection, material handling, and assembly, will be explored. By the end of the course, students will be able to understand, design, and implement basic autonomous systems in robotics
Outcomes	• Explain the core concepts and technologies that enable robot autonomy in industrial settings. • Design basic autonomous systems that allow robots to perform tasks without human intervention. • Implement sensor fusion and perception algorithms to allow robots to perceive and understand their environment. • Develop decision-making strategies using algorithms like decision trees, reinforcement learning, and behavior trees. • Apply path planning techniques to navigate robots in dynamic environments. • Understand the integration of AI and machine learning for autonomous decision-making and continuous improvement. • Evaluate the challenges and limitations of robot autonomy in real-world smart manufacturing scenarios
Content	**Introduction to Robot Autonomy** • Definition and significance of autonomy in robotics. • The role of autonomous robots in smart manufacturing systems. • Overview of autonomous systems: sensors, algorithms, and control. • Key components: perception, decision-making, path planning, and control. • Examples of autonomous robots in manufacturing and industrial automation. **Robot Perception and Sensor Integration**

	• Overview of robot perception: How robots "see" and "understand" their environment. • Types of sensors used in autonomous robots: cameras, LIDAR, radar, IMUs, and ultrasonic sensors. • Sensor fusion: Combining data from multiple sensors to improve robot perception. • Visual perception: Image processing, feature extraction, and object detection. • Real-time environmental mapping and localization (e.g., SLAM - Simultaneous Localization and Mapping). **Decision-Making and Control Strategies** • Introduction to decision-making algorithms in autonomous robots. • Classical decision-making approaches: rule-based systems, finite state machines, and behavior trees. • Advanced decision-making: Machine learning algorithms (supervised, unsupervised, and reinforcement learning). • Control strategies for autonomous robots: PID controllers, model-based control, and adaptive control. • Introduction to reinforcement learning and its applications in robot autonomy. **Path Planning and Navigation** • Introduction to path planning: generating optimal paths in dynamic environments. • Algorithms for path planning: A*, D*, Rapidly exploring Random Tree (RRT). • Real-time navigation and obstacle avoidance. • Motion planning for robots: kinematics, trajectory generation, and control. • Localization and mapping for autonomous navigation. • Multi-robot coordination and collaborative navigation in smart manufacturing environments. **Autonomous Systems in Smart Manufacturing** • Applications of robot autonomy in smart manufacturing: Automated material handling, inspection, assembly, and packaging. • Case studies of autonomous robots in factories: Automated Guided Vehicles (AGVs), robotic arms, and drones. • Real-time systems integration in manufacturing environments. • Challenges of autonomy in industrial applications: safety, robustness, and scalability. • The future of robot autonomy in manufacturing: AI, IoT, and Industry 4.0. **Challenges and Future Directions** • Technical and operational challenges in robot autonomy. • Ethical, safety, and regulatory concerns related to autonomous robots.

	• The future of autonomous robotics: Trends, innovations, and evolving technologies. • Integration with other smart manufacturing technologies: IoT, AI, and big data. • The role of autonomous robots in the future of smart factories and manufacturing systems. • Hands-on experience with programming and implementing autonomous systems using tools such as ROS (Robot Operating System). • Projects on developing simple autonomous robots, focusing on sensor integration, path planning, and decision-making. • Lab exercises to implement real-time navigation and decision-making algorithms. • Case study discussions on real-world autonomous robotics applications in smart manufacturing.

Year 1: Second Trimester	
Course Name	Embedded System for Robotics
Credits	2
Learning Hours	60
Description	This course focuses on the design and implementation of embedded systems for robotics in the context of smart manufacturing. Embedded systems are the backbone of robotic systems, enabling real-time control, data processing, and sensor integration. The course will provide students with a solid understanding of microcontrollers, sensors, actuators, and communication protocols used in robotics applications. Topics include hardware and software integration, programming embedded systems, interfacing with sensors and actuators, and the real-time constraints often encountered in robotics systems. By the end of the course, students will be equipped with the skills to develop and deploy embedded systems in robotic applications for industrial automation
Outcomes	• Understand the components and architecture of embedded systems in robotics. • Program microcontrollers to interface with sensors, actuators, and communication systems in robotics. • design and develop embedded systems for controlling robotic devices in a manufacturing environment. • Solve real-time control problems by designing efficient embedded solutions for robots. • Integrate hardware and software components into functioning embedded robotic systems. • Apply embedded systems for various robotics tasks, including sensing, actuation, and communication in smart manufacturing.

Content	**Introduction to Embedded Systems** • Overview of embedded systems in robotics and smart manufacturing. • Components of an embedded system: microcontrollers, sensors, actuators, and communication interfaces. • Introduction to real-time systems and their constraints. • Comparison of embedded systems with general-purpose computing systems. • Applications of embedded systems in robotics: robot control, sensor data acquisition, and communication. **Microcontrollers and Hardware Platforms** • Introduction to microcontrollers: architecture, components, and types. • Popular microcontrollers for robotics: Arduino, Raspberry Pi, ARM-based systems, and PIC microcontrollers. • Selecting a microcontroller for robotics applications: power consumption, processing power, I/O requirements. • Input/Output (I/O) pins, ADC/DAC, timers, interrupts, and communication interfaces (SPI, UART, I2C). • Hands-on lab: Setting up and programming a basic embedded system using Arduino or similar platforms. **Sensors and Actuators in Robotics** • Types of sensors in robotics: distance sensors (ultrasonic, LIDAR), vision sensors (cameras, IR), and force sensors (load cells). • Interfacing sensors with embedded systems: analog-to-digital conversion, sensor calibration, and data processing. • Types of actuators: DC motors, stepper motors, servos, and pneumatic actuators. • Motor control techniques: PWM (Pulse Width Modulation), H-bridge circuits, and motor drivers. • Hands-on lab: Interfacing a sensor and actuator with a microcontroller to control robotic motion. **Real-Time Operating Systems (RTOS) in Robotics** • Introduction to real-time systems and their significance in robotics. • Overview of RTOS: features, tasks, scheduling, and interrupt handling. • Task management in robotics: multitasking, task synchronization, and real-time constraints. • RTOS examples for robotics: FreeRTOS, ChibiOS, and embedded Linux. • Hands-on lab: Implementing simple task scheduling using an RTOS for a robot. **Communication Protocols for Robotics** • Communication in robotic systems: wired vs wireless protocols.

	• Overview of communication protocols: UART, SPI, I2C, CAN bus, and Bluetooth. • Wireless communication in robotics: Wi-Fi, ZigBee, and Bluetooth Low Energy (BLE). • Integration of communication protocols for sensor data acquisition and actuator control in robots. • Hands-on lab: Setting up and programming communication between embedded systems and wireless modules (e.g., Bluetooth, Wi-Fi). **Embedded System Integration in Robotics** • Integrating hardware and software for robotics applications. • Real-time control of robotic systems: feedback loops, control algorithms, and system optimization. • Debugging and testing embedded robotic systems: tools, techniques, and strategies. • Case studies of embedded systems in industrial robots and automation systems. • Application scenarios: material handling, assembly line robots, and automated inspection systems. **Challenges and Future Trends in Embedded Systems for Robotics** • Challenges in designing embedded systems for robotics: power, size, cost, and reliability. • Power management techniques for embedded robotics systems. • Trends in embedded systems: the rise of AI, machine learning, and IoT in robotics. • Future directions: IoT-enabled robots, edge computing, and autonomous systems in manufacturing. • Hands-on exercises using microcontrollers like Arduino or Raspberry Pi to build and program simple robotic systems. • Lab exercises to interface sensors and actuators with embedded systems. • Group project: Design an embedded system for a specific robotic application in smart manufacturing, such as automated material handling or robot control.

Year 1: Second Trimester	
Course Name	Advance Network Communication and Security in Robotics
Credits	2
Learning Hours	60
Description	This course provides an in-depth understanding of advanced network communication and security techniques necessary for robotic systems in smart manufacturing environments. With the rise of connected systems in Industry 4.0, robotics must be able to communicate seamlessly within

	complex networks while ensuring secure data transfer and protection from cyber threats. The course will cover network protocols, wireless communication methods, network architectures for robotics, and the principles of cybersecurity tailored to the needs of robotic systems. Students will gain practical knowledge on secure communication methods, the design of secure robotic networks, and how to address vulnerabilities in robotic systems within a connected manufacturing environment
Outcomes	• Understand the advanced communication protocols and network architectures used in robotics and industrial automation. • Design and implement networked communication solutions for robotic systems, ensuring reliable and real-time data exchange. • Assess and address cybersecurity risks in robotic systems and networks. • Implement encryption, authentication, and secure data transmission methods for robotic communications. • Understand the integration of wireless communication technologies, such as Wi-Fi, Bluetooth, and 5G, in robotics. • Apply security best practices to safeguard robotic systems from cyberattacks and vulnerabilities in a manufacturing setting.
Content	**Introduction to Network Communication in Robotics** • Role of communication in robotics within smart manufacturing. • Overview of communication requirements for robots: real-time control, data transfer, and coordination. • Types of communication: wired (Ethernet, TCP/IP) vs. wireless (Wi-Fi, ZigBee, 5G, etc.). • Communication challenges in robotics: latency, bandwidth, reliability, and synchronization. • Introduction to industrial communication networks for robotics. **Communication Protocols and Architectures for Robotics** • TCP/IP and UDP: differences, advantages, and disadvantages for robotic communication. • Industrial communication protocols: Modbus, CAN bus, EtherCAT, Profinet, and MQTT for robotics. • Overview of real-time communication protocols in robotics (e.g., Real-Time Ethernet, ROS communication mechanisms). • Wireless communication protocols for robotics: Bluetooth, ZigBee, Wi-Fi, and low-power protocols. • System architecture for robotic communication in smart manufacturing: centralized vs. decentralized systems, client-server models, and peer-to-peer models. • Hands-on lab: Setting up a communication network for robotic systems using TCP/IP and MQTT. **Wireless Communication in Robotics**

	• Principles of wireless communication for robotics. • Design considerations for wireless communication in industrial robots. • Integration of Wi-Fi, Bluetooth, ZigBee, and LoRaWAN in robotic systems. • Challenges of wireless communication: interference, range, power consumption, and security. • Emerging technologies: 5G and its application in robotics for real-time communication. • Hands-on lab: Implementing wireless communication for a robotic system using Bluetooth or Wi-Fi. **Cybersecurity in Robotic Systems** • Introduction to cybersecurity in robotics and smart manufacturing. • Types of cybersecurity risks in robotic systems: data interception, unauthorized access, malicious code, denial of service attacks. • Cyberattack scenarios in robotics: examples of vulnerabilities and real-world case studies. • Securing robotic communication: encryption, digital signatures, and VPNs. • Authentication methods: certificates, multi-factor authentication, and secure key management. • Securing robotic control systems: ensuring the integrity of robot commands and feedback signals. • Hands-on lab: Implementing secure communication channels using SSL/TLS or VPNs. **Networked Robotics and the Internet of Things (IoT)** • Overview of IoT and its role in smart manufacturing: connecting robots, sensors, and systems. • IoT protocols: HTTP, CoAP, MQTT, and their application in robotics. • Integration of sensors, actuators, and robots within an IoT ecosystem. • Edge computing and cloud-based communication for robotics. • Future trends: Autonomous systems, Industry 4.0, and the evolution of networked robotics. • Hands-on lab: Implementing a simple IoT system to monitor and control robotic tasks. **Addressing Security Vulnerabilities and Future Trends** • Identifying and addressing common vulnerabilities in robotics networks. • Cybersecurity frameworks for industrial robots: NIST, ISO/IEC, and IEC 62443. • Best practices for securing robotic systems in smart manufacturing: access control, patch management, and continuous monitoring. • Emerging technologies and trends in networked robotics and cybersecurity.

	• Case studies on addressing security issues in industrial robotics and automation. • Future directions: Blockchain for robotic security, secure AI, and autonomous robotic systems. • Hands-on projects to implement secure network communication for robotic systems using industry-standard protocols. • Lab exercises to integrate wireless communication modules (Wi-Fi/Bluetooth) with robots and secure the data exchange. • Group project: Design and implement a secure robotic communication system using encryption and secure protocols in a simulated industrial environment.

Year 1: Second Trimester	
Course Name	Business Management for Robotics & Automation
Credits	2
Learning Hours	60
Description	This course introduces students to the principles and practices of business management with a focus on robotics and automation in smart manufacturing environments. Students will explore how businesses can effectively leverage robotics and automation technologies to improve operational efficiency, productivity, and competitiveness in the manufacturing sector. Key topics include strategic management, financial analysis, project management, marketing of robotic solutions, and the organizational impact of robotics adoption. The course will also cover the economic and ethical implications of automation, business sustainability, and managing innovation in robotics and automation companies. By the end of the course, students will be equipped with the skills to manage robotics projects and businesses, aligning technological innovation with strategic business goals
Outcomes	• Analyze the role of robotics and automation in modern manufacturing businesses. • Develop business strategies that incorporate robotics and automation technologies. • Conduct cost-benefit analyses to determine the feasibility of robotics integration in manufacturing operations. • Manage robotics projects, including planning, execution, and risk management. • Formulate marketing strategies for promoting robotics and automation solutions. • Understand the financial, ethical, and environmental considerations in the adoption of robotic systems.
Content	**Introduction to Business Management in Robotics & Automation**

	• Overview of business management principles in the context of robotics and automation. • The evolution of robotics and automation in manufacturing: historical perspectives and current trends. • Strategic importance of robotics in improving business operations: efficiency, quality, and innovation. • The role of automation in competitive advantage and market positioning. • Industry-specific case studies: Robotics in automotive, electronics, and food industries. **Strategic Management for Robotics & Automation** • Strategic planning for robotics and automation: aligning technological advancements with business goals. • SWOT analysis (Strengths, Weaknesses, Opportunities, Threats) for robotics companies. • Understanding market dynamics: global trends in robotics and automation, market segmentation, and customer demand. • Identifying key performance indicators (KPIs) for robotic automation success. • Business models for robotics companies: B2B vs. B2C approaches, service-based models, and product sales. • Risk management strategies: technological risks, operational risks, and market risks. **Financial Management for Robotics Projects** • Cost structure of robotics and automation projects: capital expenditure (CAPEX) vs. operational expenditure (OPEX). • Financial analysis: Return on Investment (ROI), Net Present Value (NPV), and payback period for robotics systems. • Budgeting and cost control for robotics and automation projects. • Financing options for robotics investments: loans, venture capital, and government incentives. • Financial modeling for scaling up automation: understanding cash flow, pricing, and profitability. • Case study: Financial planning for the introduction of robotics in a manufacturing plant. **Project Management in Robotics & Automation** • Project life cycle: Planning, design, execution, and closure of robotics projects. • Tools for project management: Gantt charts, Critical Path Method (CPM), and Agile methodology for robotics. • Resource management: human resources, robotic hardware, and software tools. • Managing timelines, budgets, and risk in automation projects.

	• Human factors and team dynamics in robotics projects: cross-disciplinary teams, communication, and leadership. • Case study: Managing a robotics integration project in a smart factory. **Marketing Robotics & Automation Solutions** • Understanding the market for robotics and automation solutions: customers, competitors, and trends. • Marketing strategies for robotics companies: B2B sales, direct marketing, and trade shows. • Branding and positioning: How to position a robotics product in the marketplace. • Pricing strategies for robotics solutions: cost-based pricing, value-based pricing, and competitive pricing. • Building customer relationships: After-sales service, support, and customer training. • Case study: Marketing a robotics automation system for a manufacturing client. **Ethical, Legal, and Sustainability Considerations in Robotics & Automation** • Ethical implications of robotics and automation: impact on jobs, workforce transformation, and social responsibility. • Legal issues: intellectual property, liability, and regulations governing the use of robots in manufacturing. • Environmental sustainability: energy consumption, waste reduction, and life-cycle analysis of robotic systems. • Business ethics: transparency, accountability, and stakeholder engagement in robotics projects. • Future trends: sustainable robotics, energy-efficient systems, and circular economy models. • Hands-on projects in designing business strategies for robotics companies. • Group project: Develop a business plan for the integration of robotics in a manufacturing process, including financial projections and market strategy. • Role-playing exercises: Simulation of a marketing pitch for a robotics solution, including customer feedback and negotiation. • Case study analysis of successful robotics companies in smart manufacturing (e.g., ABB, KUKA, Fanuc).

Year 1: Second Trimester	
Course Name	Reliability and Quality for Engineers
Credits	2
Learning Hours	60

Description	This course is designed to equip students with the fundamental knowledge and skills necessary to ensure the reliability and quality of engineering systems and products, particularly in smart manufacturing environments. Reliability and quality are critical to improving product performance, reducing waste, and enhancing customer satisfaction in modern manufacturing systems. The course will cover key concepts such as reliability analysis, failure modes, quality control techniques, and statistical process control (SPC). It also emphasizes practical applications of reliability engineering and quality management techniques in manufacturing processes, ensuring that systems and products perform consistently throughout their lifecycle. Students will learn how to implement and maintain effective reliability and quality assurance strategies in the context of advanced manufacturing technologies and smart manufacturing.
Outcomes	• Define key concepts of reliability and quality and apply them to engineering and manufacturing problems. • Perform reliability calculations, including Mean Time Between Failures (MTBF) and failure rate. • Use quality control methods such as control charts, capability analysis, and Six Sigma techniques to improve manufacturing processes. • Conduct failure modes and effects analysis (FMEA) and root cause analysis to identify and address issues in systems and processes. • Design and implement a quality assurance system for manufacturing processes. • Apply maintenance strategies such as preventive and predictive maintenance to ensure system reliability and longevity
Content	**Introduction to Reliability and Quality in Engineering** • Introduction to Reliability and Quality Concepts: Importance of reliability and quality in manufacturing. • Key Terms: Reliability, quality, failure, defect, and lifecycle. • Industry Standards and Certifications: ISO 9001, Six Sigma, Total Quality Management (TQM), and Lean Manufacturing. • Impact of Poor Quality and Reliability on Business: Cost of defects, downtime, waste, and customer dissatisfaction. **Reliability Engineering** • Reliability Metrics: Mean Time Between Failures (MTBF), Mean Time to Repair (MTTR), and Availability. • Reliability Models: Exponential and Weibull distribution models, and their applications in reliability testing. • Reliability Data Collection: Methods for collecting failure data and performing accelerated life testing. • Reliability Block Diagrams (RBD) and Fault Tree Analysis (FTA): Visualizing system reliability and analyzing failure pathways.

	• Hands-on Exercises: Calculating reliability metrics for engineering systems. **Statistical Process Control (SPC) and Quality Control Techniques** • Introduction to SPC: Importance of monitoring and controlling process variability to maintain quality. • Control Charts: Types of control charts (X-bar, R, p-chart), interpretation, and action plans for out-of-control signals. • Process Capability Analysis: Cp, Cpk, and process sigma levels, understanding process performance. • Introduction to Six Sigma: DMAIC (Define, Measure, Analyze, Improve, Control) methodology for process improvement. • Quality Improvement Tools: Pareto charts, Fishbone diagrams (Ishikawa), and histograms. • Hands-on Exercise: Constructing control charts and conducting process capability analysis on sample data. **Failure Modes and Effects Analysis (FMEA) and Root Cause Analysis** • FMEA Methodology: Steps for identifying potential failure modes, their causes, and effects on system performance. • Risk Priority Number (RPN): Calculating and prioritizing risks in manufacturing processes. • Root Cause Analysis (RCA): Techniques like the 5 Whys and Fishbone diagrams for identifying underlying causes of failures. • Corrective and Preventive Actions (CAPA): Implementing actions based on FMEA and RCA to improve system reliability. • Hands-on Exercise: Conducting an FMEA for a sample manufacturing process and identifying corrective actions. **Quality Assurance and Quality Management Systems** • Quality Assurance Systems: Designing systems to monitor and ensure the quality of manufacturing processes. • Quality Audits: Methods for auditing manufacturing processes and assessing compliance with quality standards. • Total Quality Management (TQM): Principles and practices of TQM, including continuous improvement, customer focus, and employee involvement. • Integration with Smart Manufacturing: Using sensors, IoT, and data analytics to monitor quality in real-time. • Case Study: Successful implementation of quality assurance systems in smart factories. **Maintenance Strategies for Reliability** • Maintenance Strategies: Preventive maintenance, corrective maintenance, and predictive maintenance.

	• Total Productive Maintenance (TPM): Strategies for improving equipment reliability through employee involvement and maintenance optimization. • Predictive Maintenance (PdM): Using condition monitoring and data analytics for proactive maintenance. • Role of Maintenance in Smart Manufacturing: Integrating maintenance with IoT and predictive analytics for enhanced system uptime. **Application of Reliability and Quality in Smart Manufacturing** • Smart Manufacturing Technologies: Role of robotics, automation, AI, and machine learning in improving reliability and quality. • Data-Driven Decision Making: Using real-time data to monitor and control manufacturing processes. • Future Trends in Quality and Reliability: Impact of digital twins, machine learning, and autonomous systems on reliability and quality management. • Case Study: Reliability and quality strategies in leading smart factories.

Year 1: Third Trimester	
Course Name	AI and ML in Robotics
Credits	2
Learning Hours	60
Description	This course provides an introduction to the application of Artificial Intelligence (AI) and Machine Learning (ML) techniques in robotics, specifically within the context of smart manufacturing. As manufacturing systems become more automated and data-driven, AI and ML play crucial roles in improving robot autonomy, decision-making, and process optimization. Students will learn how AI and ML algorithms enable robots to perform tasks such as visual perception, motion planning, adaptive control, predictive maintenance, and quality inspection. The course covers foundational concepts in AI and ML, as well as practical applications in robotics, with an emphasis on using AI-driven systems to enhance efficiency, precision, and flexibility in modern manufacturing environments. By the end of the course, students will be equipped with the skills to implement AI and ML models in robotic systems to solve real-world manufacturing problems.
Outcomes	• Explain the basic principles of AI and ML and their applications in robotics. • Identify and apply AI and ML techniques to enhance robotic systems in smart manufacturing. • Develop and implement machine learning models for perception, motion planning, and control in robots. • Apply reinforcement learning and deep learning algorithms to improve robot autonomy in manufacturing tasks.

	• Use AI for predictive maintenance, quality control, and process optimization in manufacturing systems. • Critically analyze and evaluate the impact of AI and ML on manufacturing automation and decision-making processes
Content	**Introduction to AI and ML in Robotics** • Overview of AI and ML in Robotics: Key concepts, history, and trends in AI and robotics. • Types of AI: Narrow AI vs. General AI, machine learning, deep learning, and reinforcement learning. • Role of AI in Robotics: How AI enables robot autonomy, decision-making, and learning in dynamic environments. • Applications of AI and ML in Robotics: Industrial robots, autonomous mobile robots, collaborative robots (cobots), and industrial automation systems. **Machine Learning Basics for Robotics** • Supervised Learning: Introduction to supervised learning algorithms (regression, classification), training models, and evaluating performance. • Unsupervised Learning: Clustering, dimensionality reduction, and anomaly detection techniques for robot behavior analysis and data processing. • Data Collection and Preprocessing: Methods of collecting and preparing data for machine learning models in robotics. • Tools and Libraries for Machine Learning in Robotics: Introduction to Python, TensorFlow, PyTorch, and scikit-learn for robotic applications. **AI Algorithms for Robot Perception** • Computer Vision in Robotics: Image processing, object detection, image classification, and segmentation for robot vision. • Sensor Fusion: Combining data from various sensors (camera, LiDAR, IMUs) to improve robot perception and environment mapping. • Deep Learning for Perception: Convolutional Neural Networks (CNNs) for image recognition and deep learning for autonomous navigation. • Application to Manufacturing: Quality inspection, defect detection, and visual guidance for robotic arms and AGVs (Automated Guided Vehicles). • Hands-on Exercise: Implementing a simple image recognition system for a robot using a camera sensor. **Machine Learning for Robot Control and Planning** • Motion Planning: Algorithms for planning robot movements in dynamic and uncertain environments. • Reinforcement Learning (RL): Overview of RL, Q-learning, and Deep Q Networks (DQNs) for robot control and decision-making.

	• Model Predictive Control (MPC): Use of AI in optimizing robot motion and control in real-time. • Application to Robotics in Manufacturing: Adaptive control systems for robots working with varying parts and assembly lines. • Hands-on Exercise: Implementing reinforcement learning algorithms for robot navigation in a simulated environment. **AI & ML for Predictive Maintenance and Quality Control** • Predictive Maintenance with AI: Using machine learning models (e.g., regression, decision trees) to predict equipment failures and plan maintenance schedules. • Condition Monitoring and Fault Detection: Real-time monitoring of robot health and system performance using AI-driven analytics. • AI for Quality Control: Automating defect detection and classification using machine vision and AI techniques for quality assurance in manufacturing. • Application to Smart Manufacturing: Integrating AI and ML into Industry 4.0 systems for predictive maintenance, autonomous quality checks, and process optimization. • Case Study: Implementing predictive maintenance and quality control in a real-world manufacturing setting. **Advanced AI Techniques for Robotics** • Deep Reinforcement Learning (DRL): Advanced concepts of DRL for autonomous decision-making in robots. • Generative Adversarial Networks (GANs): Use of GANs for data augmentation and generating realistic simulations for robot training. • Transfer Learning: How to apply pre-trained models to new robotics tasks with minimal data. • AI and ML Integration in Robotic Systems: Challenges and opportunities for combining AI models with robotic hardware for real-time performance. • Trends and Future of AI in Robotics: Autonomous robots, robotics as a service (RaaS), and AI-driven manufacturing automation. **Future Trends and Industry Applications** • Emerging Trends in Robotics: AI-powered cobots, self-learning robots, and collaborative human-robot workspaces. • AI in Industry 4.0: Role of AI and ML in creating smart, autonomous factories with interconnected systems. • Ethics and AI in Robotics: Addressing safety, privacy, and job displacement concerns in AI-driven robotics. • Future Applications in Smart Manufacturing: Innovations in robot learning, adaptive control, and the integration of AI for next-gen manufacturing processes. • Case Study: Exploring the use of AI & ML in a smart manufacturing plant.

	• Hands-on Programming: Implementing a machine learning model to enhance a robot's task (e.g., navigation, object detection, quality inspection). • Case Study Project: Students will work in groups to design an AI-driven robotic system for a specific manufacturing process (e.g., assembly line, inspection system). • Simulation and Testing: Use simulation tools (e.g., Gazebo, V-REP) to test AI algorithms in virtual environments before deployment.

Year 1: Third Trimester	
Course Name	Digital Twin in Robotics
Credits	2
Learning Hours	60
Description	The course "Digital Twin in Robotics" provides an in-depth understanding of the concept of digital twins and their applications in robotics, particularly in smart manufacturing environments. A digital twin is a virtual model of a physical system that is used to simulate, analyze, and optimize its real-time performance. In the context of robotics, digital twins allow for the replication of robotic systems, enabling real-time monitoring, predictive maintenance, performance optimization, and troubleshooting. This course covers the key principles, tools, and technologies involved in creating and utilizing digital twins for robotic systems. Students will learn how digital twins integrate with robotics, sensors, and IoT technologies, and how they can be used to improve robot autonomy, process efficiency, and reduce downtime in manufacturing settings. Practical applications in manufacturing processes such as production lines, warehouse automation, and maintenance scheduling will be explored through case studies and hands-on exercises.
Outcomes	• Define the concept of a digital twin and explain its role in the context of robotics and smart manufacturing. • Design and develop a digital twin model for robotic systems using simulation software and data integration techniques. • Integrate sensors and IoT technologies with digital twins to enable real-time data collection and analysis. • Utilize digital twin technology for predictive maintenance, performance monitoring, and fault detection in robotic systems. • Apply digital twin models to optimize robotic tasks and improve overall system efficiency. • Discuss the future potential and challenges of digital twins in Industry 4.0 and smart manufacturing environments.
Content	**Introduction to Digital Twin Technology** • What is a Digital Twin? Definition, history, and evolution of digital twin technology.

	• Components of a Digital Twin: Physical object, virtual model, data connection, and analytics layer. • Digital Twin vs. Traditional Models: Advantages of digital twins in robotics and smart manufacturing over traditional physical models and simulations. • Applications of Digital Twins in Industry: Examples of digital twin applications across various industries, with a focus on robotics and smart manufacturing. • Key Technologies Behind Digital Twins: IoT, cloud computing, big data, machine learning, and simulation. **Digital Twin Architecture and Components** • Architectural Components of Digital Twins: Sensors, actuators, communication protocols, data storage, and visualization tools. • Data Flow in a Digital Twin System: Collection of real-time data from physical robots, transmission to the digital twin model, and data analytics. • Types of Digital Twins: Component twins, system twins, and process twins, and their specific applications in robotics. • Digital Twin Models for Robotics: Creating virtual models of robots, including kinematic, dynamic, and control models. • Software Tools for Digital Twin Creation: Overview of simulation software such as MATLAB, Simulink, ROS, Unity, and other CAD/CAE tools. • Hands-on Exercise: Developing a simple digital twin for a robotic arm using simulation software. **Integration of IoT and Sensors with Digital Twins** • IoT in Robotics: Role of IoT devices in enabling real-time communication and data collection for robots. • Sensor Technologies: Types of sensors (e.g., accelerometers, cameras, force sensors) used in robotics and their role in digital twin systems. • Data Acquisition and Communication Protocols: Methods of collecting and transmitting data from physical robots to the digital twin in real-time (e.g., MQTT, OPC UA, HTTP). • Cloud Integration: Storing, processing, and analyzing data from digital twins in the cloud for remote monitoring and management. • Edge Computing for Robotics: Using edge devices for local processing of sensor data before sending it to the cloud for further analysis. • Hands-on Exercise: Setting up a simple IoT network to collect data from sensors and send it to a digital twin model. **Digital Twin Applications in Robotics** • Predictive Maintenance with Digital Twins: Using digital twins to predict robot failures, schedule maintenance, and reduce downtime. • Performance Monitoring: Tracking robot performance in real-time and using digital twins to optimize robotic tasks (e.g., path planning, energy consumption).

	• Fault Detection and Diagnostics: Using digital twin data to identify faults in robot components and diagnose issues. • Real-Time Control with Digital Twins: Applying digital twin technology for adaptive control and dynamic decision-making in robotic systems. • Quality Control and Process Optimization: Using digital twins to improve the efficiency of manufacturing processes, optimize robot motion, and ensure product quality. • Case Study: Examining a real-world example of digital twins in a robotic manufacturing application, such as robotic arms in assembly lines. **Simulation and Virtual Testing with Digital Twins** • Virtual Prototyping: How digital twins allow for simulation and testing of robotic systems before deployment. • Simulating Robot Behavior: Modeling the behavior of robots in different scenarios and analyzing outcomes in a virtual environment. • Real-Time Simulations for Optimization: Running simulations with live data to optimize robot tasks and processes in real-time. • Hands-on Exercise: Creating and testing a digital twin of a robot in a simulated manufacturing environment (using simulation tools like ROS, Gazebo, or V-REP). **Future Trends and Challenges in Digital Twin Technology** • Emerging Trends in Digital Twins: AI and machine learning integration with digital twins, autonomous robots, and next-gen manufacturing technologies. • The Role of Digital Twins in Industry 4.0: How digital twins contribute to the realization of smart factories and autonomous production systems. • Challenges and Limitations: Data security and privacy concerns, data quality, cost of implementation, and scalability issues. • The Future of Digital Twin Technology: Exploring the potential of digital twins in robotics and manufacturing, including AI-driven predictive analytics and self-optimization. • Case Study: Future applications of digital twins in robotics and smart manufacturing (e.g., autonomous mobile robots, self-learning robots). • Hands-on Exercises: Developing a digital twin for a robotic system using simulation software (e.g., MATLAB/Simulink, V-REP, or Unity). • Implementing IoT sensors and data acquisition systems to create a real-time connection with a digital twin. • Predictive maintenance and fault detection using digital twin data in a manufacturing simulation. • Project Work: Develop a complete digital twin-based system for monitoring and optimizing a robotic process in a smart manufacturing scenario.

Year 1: Third Trimester	
Course Name	Project (Phase-1) Robotics System Design and Feasibility Study
Credits	2
Learning Hours	60
Description	Robotics System Design and Feasibility Study
Outcomes	Robotics System Design

Year 1: Third Trimester	
Course Name	Project (Phase-2) Robotics Solution Deployment and Business Implementation
Credits	2
Learning Hours	60
Description	Robotics Solution Deployment and Business Implementation
Outcomes	Robotics Solution Deployment

Year 1: Third Trimester	
Course Name	Operational Excellence
Credits	2
Learning Hours	60
Description	This course delves into the principles, methodologies, and best practices that underpin operational excellence, equipping participants with the tools to optimize processes, enhance productivity, and drive innovation within manufacturing operations.
Outcomes	• Students will learn the best practices that underpin operational excellence. • Will learn various tools to optimize processes, enhance productivity, and drive innovation within manufacturing operations. • Will learn Lean Manufacturing Principles and Practices • Will learn Six Sigma Methodology for Process Improvement
Content	• Introduction to Operational Excellence in Advanced Manufacturing • Lean Manufacturing Principles and Practices • Six Sigma Methodology for Process Improvement • Total Productive Maintenance (TPM) and Asset Management • Continuous Improvement Culture and Kaizen • Quality Management Systems (QMS) and ISO Standards • Change Management and Leadership in Operational Excellence • Supply Chain Optimization and Vendor Management • Advanced Manufacturing Technologies and Industry 4.0 Integration • Risk Management and Contingency Planning • Operational Excellence Metrics and Performance Measurement

	• Sustainability and Environmental Excellence in Manufacturing • Case Studies and Real-world Applications • Future Trends in Operational Excellence

Year 1: Fourth Trimester	
Course Name	Capstone Project
Credits	10
Learning Hours	300
Description	The culmination of theoretical insights and practical skills, the industry internship offers students the opportunity to engage with real-world manufacturing scenarios. Under the guidance of experienced professionals, participants navigate the complexities of Industry 4.0 in action, contributing to projects that drive innovation and transformation
Outcomes	The internship serves as a bridge between academic learning and industrial practice, enabling students to apply their knowledge, collaborate with industry experts, and gain valuable insights into the intricacies of modern manufacturing. By immersing themselves in practical challenges, students refine their skillset, broaden their perspectives, and emerge as adept contributors to the industry 4.0 landscape.

7.1.7 Proposed Evaluation Model

The evaluation framework for the proposed Deemed-to-be University will be designed to uphold academic rigor, foster continuous learning, and align with the guidelines set forth by the University Grants Commission (UGC) under the Choice-Based Credit System (CBCS). This structured yet flexible approach will ensure a robust assessment system that reflects the competencies and learning outcomes in line with the National Education Policy (NEP) 2020 and Bloom's Taxonomy.

The proposed Deemed-to-be University will implement a comprehensive evaluation system integrating continuous assessment and end-of-semester examinations. This dual-tier approach ensures that students are evaluated on a continuous basis and on their cumulative understanding at the end of each semester. The evaluation process will adopt a trimester structure, enabling an enhanced focus on each academic phase while maintaining rigorous academic standards.

The continuous assessment will play a pivotal role in the learning process, providing regular feedback to students and fostering an environment of active learning and engagement. The following components will form part of the continuous assessment framework:

- **Class Participation and Assignments:** Active engagement in classroom discussions, timely submission of assignments, and their quality will form a significant portion of the assessment.
- **Quizzes:** These will assess the students' understanding and retention of course material at regular intervals.
- **Lab Work and Presentations:** Students will be evaluated on their ability to apply theoretical concepts in practical scenarios through lab work and presentations, enhancing their problem-solving and communication skills.

Each continuous assessment component will be designed following Bloom's Taxonomy to ensure that evaluations cover various cognitive levels—remembering, understanding, applying, analyzing, evaluating, and creating. While the end-of-semester examinations will assess the comprehensive understanding of the course material. These will be conducted in a controlled environment and designed to evaluate higher-order cognitive skills, as per Bloom's Taxonomy. The exams will ensure that students are tested on both theoretical knowledge and practical application.

Grade Point System

The proposed Deemed-to-be University will adopt a letter-grade system with corresponding grade points, ensuring transparency and uniformity in evaluation.

Letter Grade	Qualitative Meaning	Equivalent Grade Point
A+	Outstanding	10
A	Excellent	9
B+	Very Good	8
B	Good	7
C+	Above Average	6
C	Average	5
D	Pass	4
F	Fail	0
I	Incomplete	--
P	Passed	--

Table 3 : Grade point system

- 'F' grade is awarded when a student is not able to clear the course. It may also be awarded in case of any malpractice in examination / continuous evaluation process.
- The grade 'F' is taken into consideration while calculating GPA and CGPA. This will be replaced by a proper letter grade only after the clearing the course with passing grade.
- 'I' grade will be awarded in a course if the overall performance of the student is satisfactory in the course, but the student misses the examination due to a valid reason. It will be converted to a proper letter grade after taking the examination.
- The performance of student in a trimester is given by Trimester Grade Point Average (GPA).
- Student's cumulative performance is given by Cumulative Grade Point Average (CGPA).
- Formula for conversation of equivalent percentage = GPA or CGPA x 10

In conclusion, the evaluation model at the proposed Deemed-to-be University aims to establish a learner-centric environment, blending continuous assessment with periodic comprehensive evaluations. This ensures a holistic measure of student performance, consistent with modern educational standards and the evolving needs of the academic and professional world.

7.1.8 15 Year Strategic Plan for Academics

The program roll-out will happen in a phased manner as illustrated below:

1 – 5 Year Plan
• Launch and operationalization of 4 new schools – School of Manufacturing Design and AI, School of Robotics, School of Sustainability • Launch of 5 flagship master programs with specializations in smart manufacturing technology and management, automotive systems technology and management, semiconductor manufacturing technology and management, robotics engineering and management and sustainable engineering and management • Launch of 5 additional flagship master programs for which the curriculum is work in progress in collaboration with industry and academic partners (indicative specializations - Cybersecurity, Health Informatics, Prompt Engineering etc.) • Monitor modular and flipped classroom models, ensure timely course materials, and adhere to the academic calendar. • Conduct faculty reviews, prepare and assign capstone projects with industry partners, and schedule classes, labs, and faculty. • Hold feedback sessions, support at-risk students, and provide remedial support. • Conduct academic performance reviews and share grades.
6– 10 Year Plan
• Expansion of portfolio of specializations • Strengthening and scaling up of existing program offerings • Introduction of research fellowships and PhD degree
11 – 15 Year Plan
• Due to rapidly evolving technologies, during the 11–15-year time, the proposed Deemed-to-be University will focus on strengthening, consolidating, and updating the existing courses to ensure the market relevance of the programs. • Newer flagship programs will be launch based on the prevailing market requirement and technological advancements in physical sciences and allied sectors.

Table 4: 15 Year Strategic plans for academics

In conclusion, the academic plan for the proposed Deemed-to-be University provides a robust framework for delivering a high-quality educational experience to the students. By detailing the academic philosophy, structure, program offerings, pedagogy, curriculum, and rollout plan, this section underscores the institution's commitment to innovation and excellence. The strategic integration of these elements ensures that the university is well-equipped to meet the evolving needs of learners and the demands of the new age educational landscape. Through this comprehensive approach, the proposed Deemed-to-be University aims to cultivate a dynamic and impactful learning environment that fosters academic and professional success of its students.

7.2 Plan for Collaboration and Alliances

This section explores the strategic collaborations and alliances that the proposed Deemed-to-be University aims to establish with industry and academic partners, highlighting the importance of these partnerships in enhancing the educational offerings, and overall impact. The sub-sections provide detailed insights into the planned collaborations with leading industry players and esteemed academic institutions, emphasizing the mutual benefits and the innovative opportunities these alliances will bring. By fostering strong connections with external partners, the proposed Deemed-to-be University seeks to create a dynamic and supportive ecosystem for its students, faculty, and other stakeholders.

7.2.1 Academic collaboration

NAMTECH has been able to establish a robust network of global academic partners within 2 years of its operations. The partnerships are strategically designed to amplify the learning experience in alignment with its core strengths, bring unparalleled credibility to NAMTECH, leveraging the extensive expertise and innovative advancements of these esteemed institutions. Partnership with leading academic institutes highlight NAMTECH's relevance and alignment with the need to create a better equipped workforce.

A key example is the collaboration with TUM Asia, Singapore with whom the flagship iPMP in Smart Manufacturing has been successfully developed and delivered. Currently, NAMTECH is in advanced discussions with prestigious institutions such as the Massachusetts Institute of Technology (MIT), Carnegie Mellon University (CMU), Stanford Doerr Institute for Sustainability, Washington University in St. Louis, Purdue University Northwest, IIT Roorkee, IIT Gandhinagar, IIT Palakkad, IIT Ropar and others.

These collaborations aim to design, develop, and deliver cutting-edge programs and providing students with enriched learning opportunities and exceptional outcomes. Below are highlights of some of the key partnerships.

1. **Purdue University Northwest (PNW)** has signed an MoU to design an "1+1" academic pathway for NAMTECH students. PNW will be admitting students who have successfully completed the one-year iPMP in Smart Manufacturing at NAMTECH to a second year of Master of Science in Mechanical Engineering (MSME) at PNW. This is one-of-a-kind partnership providing an academic pathway to a currently non-academic program underscoring NAMTECH's innovation.
2. **Technical University of Munich (TUM) Asia, Singapore** has been a strategic partner for NAMTECH's iPMP in Smart Manufacturing program. TUM has helped NAMTECH design and deliver the program, design lab infrastructure, and provide faculty training.
3. **ITEES Singapore** has collaborated with NAMTECH for its outreach arm and iPTP program. The partnership includes academic program development, lab infrastructure design, faculty development, joint certification, and support for launch of NAMTECH's

iPTP program. In recognition of its efforts to build a world-class institution, ITEES conferred the 'Distinguished Partner' award on NAMTECH.

4. **Carnegie Mellon University (CMU)** has collaborated with NAMTECH for the Center of Community Outreach for which their Open Learning Initiative (OLI) platform will be customized for ITI student learners. The partnership also features improving learning outcomes by analyzing student learning outcomes and methodologies.
5. **IIT Roorkee** will be collaborating with NAMTECH in launch of modular one-year professional master's programs, micro-masters, management development, and masterclass programs focused on sustainable energy, circularity. In addition, IIT Roorkee has also agreed to set up Demonstration Labs for sustainable grids, energy management, building automation, water assessment, and hydrogen production and storage aiding the Living Labs at NAMTECH.
6. **Massachusetts Institute of Technology (MIT)** has agreed (MoU not signed as of now) to expand, tailor, and transfer MIT's esteemed design and manufacturing course to a state-of-the-art hands-on course at NAMTECH. In addition, a XR library of demonstration artifacts, an AR/VR product teardown "challenges", Phygital labs and corresponding instructional content will be developed to enhance the program.
7. **National Taipei University of Technology, Taiwan** has collaborated with NAMTECH to develop cooperation and academic exchange in education and research between the two educational institutions. The two institutes will carry out join research activities, faculty and student exchange programs, knowledge sharing, joint course development and implementation at NAMTECH, and guidance for establishing a Research and Training Development center at NAMTECH.
8. **LMNIIT Jaipur** and NAMTECH have collaborated on areas such as offering mentorship for integration of best practices in engineering education, curriculum design, creating user friendly online resources, pursue projects jointly, establish academic pathways, and collaborate on research and innovation.
9. NAMTECH transitory campus has been set up in **IIT Gandhinagar** research park with an area of approximately 1,00,000 sq ft.

Refer Annexure 9.2 for details

Collaboration with other institutions of higher education is a critical element of the academic community, and the proposed Deemed-to-be University recognizes this need. The partnership will help expand our impact, broaden our educational offerings, and develop a tactical geographic presence.

The proposed Deemed-to-be University plans to categorize its academic partnerships into five areas as shown in the figure below:

Figure 17 : Areas of Academic Collaboration

Partnerships for **Infrastructure** are essential to help develop cutting-edge laboratory infrastructure, accelerating innovation and positively impacting the learner community. The partners will detail the high-tech lab infrastructure required to run innovative programs envisioned. These partnerships facilitate enhancing our students' learning and development, improving their employment prospects after completing their degrees.

Partnerships for **Faculty** are crucial in developing the human capital capabilities; they will include faculty mobility, visiting faculty, faculty development programs, faculty training, etc. By creating such partnerships, the aim is to enhance teaching and research capabilities positioning itself as a highly respected academic institution in times to come.

Partnerships for **Research and Development** will aim at identifying areas for innovation, conduct combined research, and publish research papers that establishes itself as a research-driven institution with focus on applications of industry 4.0 technologies.

Partnerships for **Curriculum Development** are critical to building unique and challenging programs by developing the curriculum of the programs launched, execution of the program, and research and develop the program content, structure, and an appropriate delivery model.

Partnerships for **Student** will include student mobility, student immersion programs, joint programs, academic pathways, etc. These collaborations will help the students acquire a global perspective, provide them with opportunities to gain additional skills, and enjoy new educational experiences by participating in exchange programs.

Below table givens an insight into the cumulative numbers of academic partnerships the proposed Deemed-to-be University seeks to establish over the given period.

Partnership Area	Year 1 – 5	Year 6 – 10	Year 11 – 15
Infrastructure	5	6	7

Partnership Area	Year 1 – 5	Year 6 – 10	Year 11 – 15
Faculty	5	10	20
Research and Development	5	10	20
Curriculum Development	3	5	7
Student	4	8	12
Total Partners	**22**	**39**	**66**

Table 5 : 15 Year Plan for Academic Collaborations

These academic collaborations will broaden the educational offerings and developing a worldwide presence. These partnerships will help strengthen the academic ecosystem and community by enhancing the offerings, research, and relationships with other institutions. In conclusion, the proposed collaborations and alliances with industry and academic partners aims to create a distinct institute in India creating impact at scale and meeting the strategic needs of the country.

7.2.2 Industry collaboration

NAMTECH has been able to develop an impressive network of both global and Indian industry collaborations within 2 years of its operations. These partnerships are strategically designed to advance key areas such as infrastructure development, the creation of state-of-the-art laboratories, program development and delivery, recruitment and training initiatives, outreach efforts, and scholarship funding. Partnership with leading industry players highlight NAMTECH's relevance and alignment with the need to create a better equipped workforce.

In the first year of its operations the institute has successfully secured partnerships with leading corporations such as ASDC, FESTO, Schneider, Micron, Cisco, Fanuc, ICICI and many more discussions are in the pipeline to support its mission of industry-ready techno managers. Below are the details about collaboration with a few partners:

1. **Festo** has helped NAMTECH in the design and delivery of iPMP Smart Manufacturing along with development of lab infrastructure for the same at NAMTECH campus. Further, Festo has also designed a mobile lab infrastructure (Lab on wheels) for NAMTECH's outreach program.
2. **Schneider Electric** has also been one of the instrumental partners in the design and delivery of the iPMP in Smart Manufacturing while ensuring an industry-aligned curriculum. Further, Schneider has agreed to transforming NAMTECH's main campus into a living lab, setting fresh industry standards in sustainability and responsible living.
3. **Micron Semiconductors** has signed an MoU with NAMTECH during Vibrant Gujarat 2024 which was a significant milestone for NAMTECH. The partnership involves designing of the

curriculum for Semiconductor Manufacturing course and set up of lab infrastructure by providing industry grade equipment.

4. **ICICI Foundation** has collaborated with NAMTECH for Center for Community Outreach. The project aims to launch a pilot initiative by establishing digital infrastructure and smart labs on wheels (vehicles loaded with assessment related tools, equipment, and machinery) which will aid in providing technical, vocational education and training to ITI learners.
5. **ABB India** has collaborated with NAMTECH to scale in areas of education, training, and workforce development programs. Along with NAMTECH, ABB India will establish the School of Robotics at NAMTECH. Together the aim is to create an innovative educational framework to advance robotics education and industry integration in India, addressing the growing demand for skilled professionals in this vital field.
6. **ASDC (Automotive Skills Development Council)** is helping NAMTECH with establishment of competency centers, academic program development, assessment along with faculty identification and development. Further, ASDC will be providing equipment assistance including procurement, accreditation, and quality assurance.
7. **Siemens** has partnered with NAMTECH for education, training, and workforce development programs. Together NAMTECH and Siemens will launch elective courses under iPMP and iPTP programs in areas of smart manufacturing, automation, and develop training infrastructure.
8. **Cisco** has collaborated with NAMTECH in the areas of Skill Development, IT Education and Government Workforce Development Programs. As a part of this collaboration NAMTECH will launch elective courses and dedicated iPMP programs in cybersecurity and networking. Further, Cisco will provide NAMTECH students with experiential learning opportunities in the form of internship and industry relevant trainings.
9. **FANUC** has collaborated with NAMTECH. Some of the areas of collaboration include to enhance educational opportunities and the broader development of technical talent in NAMTECH and in India, develop training infrastructure and equipment at the NAMTECH, support and facilitate continuous learning, development of curriculum and online content, and jointly work with various State Govt. to create centers of Excellence for Robotics and Precision Engineering.
10. **INCIT (International Center for Industrial Transformation), Singapore** has collaborated with NAMTECH for jointly offering SIRI (Smart Industry Readiness Index) and COSIRI (Consumer Sustainability Industry Readiness Index) Assessor Training Program in India, create opportunities for NAMTECH faculty to build skills as a qualified, collaborate on advisory and consultancy projects using SIRI-COSIRI as a framework and to incorporate SIRI-COSIRI concepts into NAMTECH programs.
11. **HyTech Automation** has collaborated with NAMTECH for the capstone projects. This collaboration is envisioned to catalyze innovation and foster talent development for the manufacturing sector.

12. **L&T Heavy Engineering** has collaborated with NAMTECH for the capstone projects in the areas including visual inspection using drone and AI/ML, drone-based surveillance, cost thermal camera, automation of circular seam setup, and lidar for continuous scanning of plates for dimension measurement during bending operations.
13. **Marconi Technologies** has collaborated with NAMTECH for the capstone projects in the areas including robotic path optimization, factory resource utilization and power consumption, and digitalization and virtual commissioning of bottle filling, inspections, and sorting station.
14. **MG Motors India** will provide faculty / instructor training for conducting MG Nurture Program on course as per the module developed by MGI service process and quality department to the eligible students at NAMTECH. MGI will further conduct follow up programs and provide inputs to upgrade the skills of the students in the field of automobiles and electric vehicles.

Refer Annexure 9.3 for details

The proposed Deemed-to-be University believes that industry partnerships are fundamental to the success and is excited to establish a range of partnerships divided into four categories - Flagship Partnership, Strategic Partnership, Social Impact Partnership, and Other Partnerships which will take the academic excellence and infrastructure growth to the next level.

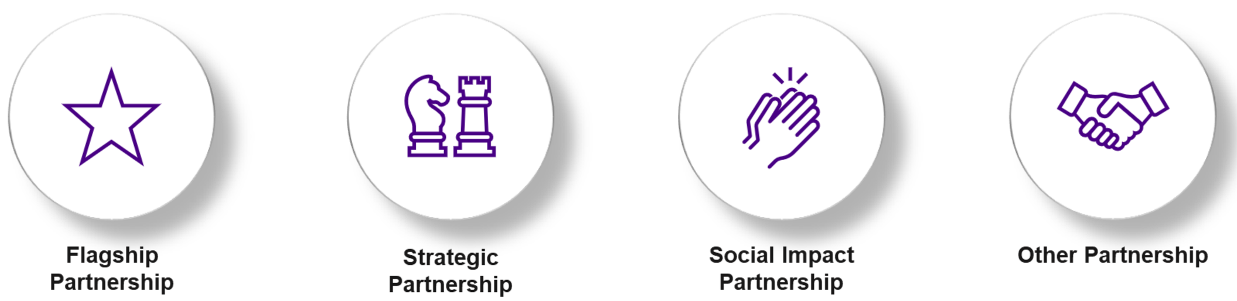

Figure 18 : Models for Industry Collaboration

Flagship Partnerships are an essential aspect of the proposed Deemed-to-be University's and will act as an anchor partner for each school and provide support for infrastructure development and create extensive laboratories aligned with industry requirements for experiential learning. This will enable the students with opportunities to work on real-world projects, gain exposure to the latest technologies, and develop their skills for the workplace of the future.

Strategic Partnerships are designed to collaborate with significant corporate entities to help the faculty and students gain insights into industry trends, knowledge sharing facilities, corporate training opportunities, and co-designing course offerings. Such partnerships will develop industry-relevant curriculum, promote greater cross-disciplinary research, and provide opportunities for its students to work with and learn from industry experts.

Social Impact Partnerships are aimed at driving positive changes for society. Industry partners will help to create value, drive innovation, and leverage technology to bring social impact in terms of enhancing outcomes in ITI ecosystem engineering. These partnerships will give the students and faculty the opportunity to engage in projects that have a meaningful impact on society and prepare them to be socially responsible leaders.

Other Partnerships will be targeted towards Scholarships, Chairs, and other forms of financial aid opportunities for donors and philanthropists to contribute and help to achieve its shared goals of academic excellence.

Below table givens an insight into the cumulative numbers of industry partnerships the proposed Deemed-to-be University seeks to establish over the given period.

Partnership Model	Year 1 – 5	Year 6 – 10	Year 11 – 15
Flagship Partners	5	6	7
Strategic Partners	20	35	42
Social Impact Partners	3	6	10
Other Partners	5	10	20
Total Partners	**33**	**57**	**79**

Table 6 : 15 Year Plan for Industry Collaborations

Growth and innovation are the backbone to provide students with the skills and experiences they need to become future-ready professionals and help create a better world for all. Such partnerships will enhance the educational experience of the students and encourage new research, innovative teaching, and learning methods.

7.3 Plan for Applied Research

This section outlines the strategic vision for fostering a dynamic applied research ecosystem at the proposed Deemed-to-be University over the next 15 years. The plan is meticulously structured to align with India's research priorities and regional development goals, aiming to cultivate a culture of application-based research. By integrating these elements, the proposed Deemed-to-be University aspires to become a leading hub for innovative and impactful applied research.

7.3.1 Overview of the Research Ecosystem in India

The proposed Deemed-to-be University's R&D framework is strategically designed to address India's growing emphasis on innovation and high-impact research, as underscored by national initiatives like the NEP 2020, Startup India, and Make in India. India has seen substantial progress in building its research ecosystem, with universities increasingly contributing to patent filings and research outputs. According to the AISHE latest report, only a fraction of the filed patents progress to commercialization, highlighting the need for stronger institutional support for intellectual property management and industry collaboration.[31] In response, the proposed Deemed-to-be University will establish a dedicated Research Park to guide researchers in identifying, filing, and commercializing patents, ultimately advancing patent grant rates and real-world applications of research. The proposed university will also closely work with the industry to solve the industry problem, contributing to the development of strategic growth areas of the industry.

The AISHE report also reveals that PhD enrolment in India has seen an 81.2% increase since 2014-15 with Engineering and Technology disciplines accounting for 24.8% of PhD enrolment, followed closely by science at 21.3%. These figures underscore the nation's commitment to deepening research in STEM fields, which will be reflected in the proposed Deemed-to-be University's focus on these priority areas. It will support PhD and postgraduate students with state-of-the-art facilities, industry-scale labs that mimic the factories, and mentorship from global experts to drive advanced research aligned with industry demands and societal needs.

Reflecting the national growth in STEM fields, AISHE reports a 25.6% enrolment in STEM at undergraduate, postgraduate, and doctoral levels. The proposed Deemed-to-be University will aid this trend by providing industry-scale labs that simulate real-world environments in sectors such as advanced manufacturing. By adopting a structured approach to technology transfer and innovation management, enabling it to serve as a regional hub for innovation and commercialization. With an incubation center dedicated

[31] AISHE Report

to supporting startups, it will provide resources for faculty and students to develop market-ready technologies, contributing to regional economic growth and societal development.

By integrating a structured, industry-aligned R&D model that emphasizes patents, applied research, and technology transfer, the aim is to become a significant contributor to India's global innovation ecosystem. These initiatives will not only advance academic knowledge but also create lasting economic and social impacts for the nation.

7.3.2 Applied Research

Applied research provides practical solutions to specific business problems by pointing the business in the right directions. It aims to simultaneously investigate and solve an issue. Within the framework of research, Technology Readiness Levels (TRL) range from identifying a problem to developing a commercialized solution. The proposed Deemed-to-be University will focus on TRL levels 4 to 8, which cover the stages from concept validation to testing and evaluation of results in the final form. This approach and structure have been adapted from NASA's original TRL structure. **Initial 5 years of operations, the proposed university will start from TRL level 4 (after consolidation of TRL level 1,2 & 3), gradually move to TRL level 5-6 during 5-10 years of operations and will achieve TRL level 8 during 10-15 years of operations.**

Below are the descriptions for the TRL levels adopted by the proposed Deemed-to-be University as per the NASA structure.

Phase	TRL	Definition	Description	Indicator
Research	1	Basic principles observed & reported	Study of published research, academic publications	• Basic identification of opportunity
	2	Technology concept & / or application formulated	Application speculation	• Concept formulation, technology review • Understand market position of technology
	3	Analytical & experimental critical function & / or characteristic proof of concept	Analytical studies, laboratory studies to physically validate the analytical predictions of separate elements of the technology	• Research results support concept
Development	4	Component validation in a laboratory environment	Successful integration of basic components	• Industry engagement in project • Value proposition stated
	5	Component validation in a relevant environment	Prototype testing in laboratory environment	• Industry provides specifications & materials • Competitive advantages of specified
	6	System / subsystem or prototype demonstration in a relevant environment	Prototype testing in relevant environment	• Prototype meets industry expectations, external stakeholder requirements.
Industry utilization	7	System prototype demonstration in a simulated operational environment	Prototype testing in operational environment	• Industry testing, customer testing
	8	System qualified through test & demonstration in a simulated operational environment	Testing and evaluation of results in final form	• Certification by external party • Customer acceptance • R&D ceased
	9	System qualified through mission operations	Actual application of technology in final form	• Industry, customer controls technology • Product for sale • Practice routinely used in production

Figure 19 : Technology Readiness Levels

The proposed Deemed-to-be University aims to perform research not only explores theoretical aspects but also results in actionable, market-ready innovations tailored for the business world. Hence, the proposed Deemed-to-be University will generate market-ready, tangible research with lasting impacts on both the regional and national economies through its focus on applied research by devising innovative products and solutions for both industry and societal challenges.

7.3.3 Research Ecosystem of the Proposed Deemed-to-be University.

The primary objective of the research ecosystem of the proposed Deemed-to-be University will be to establish a world-class research culture that fuels innovation, creates industry solutions, and drives societal advancement. This will be achieved by:

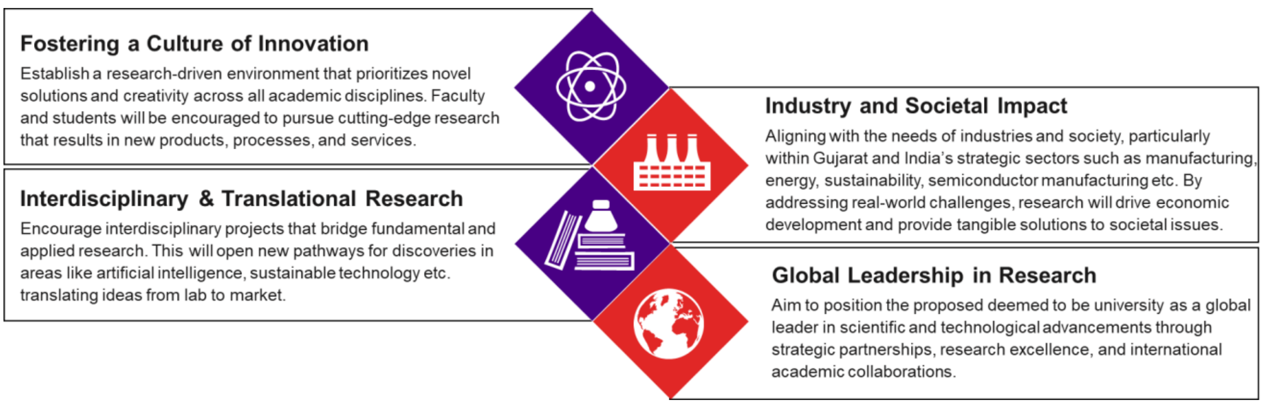

Figure 20 : Key Objectives of the Applied Research

The proposed Deemed-to-be University will establish a Research and Development Cell (RDC) as per UGC Guidelines 2022 to:

- Facilitate research collaborations between academia, industry, and international bodies.
- Ensure seamless processes for research proposals, grant submissions, and funding allocations.
- Establish a Research Information System to monitor research outputs and performance.
- Facilitate industry to solve problems with innovative solutions.

This cell will be the nucleus for driving research policy and compliance, aligning the proposed Deemed-to-be University's research agenda with both state and national goals as well as the national initiatives and policies. The Applied Research Ecosystem at the proposed Deemed-to-be University will be structured to foster a dynamic and outcome-oriented research culture that aligns with industry standards, addresses pressing technological needs, and contributes to societal development. The ecosystem will be overseen by the Research and Innovation Cell, which will serve as the apex entity driving research excellence and facilitating collaborative efforts across the proposed Deemed-to-be University. The ecosystem integrates specialized clusters, multidisciplinary centers, and enablers, creating an environment where innovative ideas can be transformed into impactful solutions.

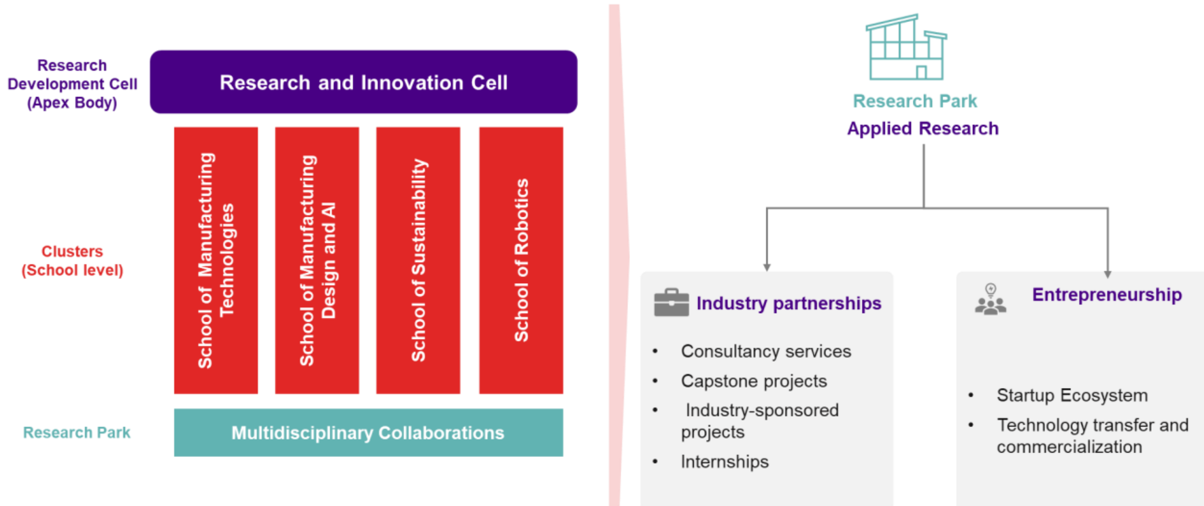

Figure 21 : Research Ecosystem

At the core of the ecosystem will be the cluster-based research schools. These clusters will represent focused areas of study, allowing for in-depth exploration and development of technologies specific to current and future industry demands. Each school will focus on a critical field:

1. **Smart Manufacturing Technologies:** The focus will be on advancing manufacturing capabilities through smart and autonomous systems including the use of Industry 4.0 technologies such as the Internet of Things (IoT), cyber-physical systems, and data analytics to enhance productivity, efficiency, and flexibility in manufacturing environments.
2. **Manufacturing Design and Artificial Intelligence (AI)**: Bridging design and AI, this cluster will focus on leveraging artificial intelligence to optimize manufacturing processes, develop intelligent design tools, and improve operational efficiency.
3. **Sustainability:** Recognizing the growing importance of sustainable practices, this cluster will be dedicated to research on reducing the environmental impact of the manufacturing industry through sustainable technologies.
4. **Robotics:** This will be the hub for research in robotics and automation, with an emphasis on developing autonomous systems that can collaborate with humans in industrial environments.

In addition to the specialized clusters under each school, the proposed Deemed-to-be University will establish a Research Park that promotes interdisciplinary research and supports applied learning and innovation.

7.3.4 Research Park

Purpose: The Research Park is envisioned as a dynamic hub for innovation, designed to support consultancy projects, applied research, and entrepreneurship. This initiative aims to harness proposed Deemed-to-be University's advanced infrastructure to foster collaboration between academia and industry, driving technological advancements and economic growth.

Applied Research:

Industry Partnerships: The research park will attract globally reputed companies to establish their research facilities within the campus. This strategic move will create a conducive environment for industry-academia collaboration, enabling seamless knowledge transfer and joint research initiatives. Industry partnerships shall enable the following:

- **Consultancy services**: The proposed Deemed-to-be University will provide consultancy services to various industries.
- **Capstone projects**: The proposed Deemed-to-be University will use its advanced laboratory infrastructure for capstone projects, offering students hands-on experience to apply their theoretical knowledge to real-world challenges.
- **Sponsored projects**: To address the latest issues in industries and develop solutions using the proposed Deemed-to-be University's infrastructure and expertise. This collaborative approach will ensure that the research conducted is both academically rigorous and commercially viable.
- **Internships**: Industries become an avenue for internships that provide invaluable real-world experience, allowing students to apply their academic knowledge in professional settings and develop essential skills for their future career.

Entrepreneurship:

- **Startup Ecosystem**: The proposed Deemed-to-be University will provide dedicated space and resources for students to develop a vibrant startup ecosystem. This will provide seed funding. This supportive environment will encourage budding entrepreneurs to transform their innovative ideas into viable products and businesses. The research park will offer mentorship, funding opportunities, and access to advanced facilities, fostering a culture of innovation and entrepreneurship.
- **Technology Transfer and Commercialization**: Startups will have access to the research park's resources for product innovation and commercialization. This support will help in the creation of intellectual property and the establishment of a technology accelerator. By providing the necessary infrastructure and resources, the proposed

Deemed-to-be University will enable startups to bring their products to market more efficiently and effectively, driving economic growth and technological progress.

Further, the proposed Deemed-to-be University's Research Ecosystem is supported by three primary enablers – Industry, Academia, and Entrepreneurship. These enablers will provide the resources, partnerships, and opportunities essential for advancing research and translating knowledge into tangible outcomes.

The proposed Deemed-to-be University's Applied Research Ecosystem will adopt a proactive approach to identifying and prioritizing emerging research areas across all clusters and centers. By continuously monitoring technological trends, societal needs, and industry demands, it will ensure its research efforts remain relevant and impactful. Each cluster and center will be encouraged to identify research priorities that align with both global advancements and local needs, positioning itself at the forefront in India. This comprehensive, multi-faceted approach will not only strengthen the position as a research-driven institution but also create pathways for students, researchers, and faculty to contribute through meaningful and transformative research.

7.3.5 Achieving Excellence in Research

The proposed Deemed-to-be University will ensure the successful and smooth implementation of various initiatives by adopting the below best practices:

Area	Details
Policies and Procedures	• **Research opportunity analysis procedure:** Dedicated process conducting research analysis to identify suitable research opportunities and an evaluation of internal human resources capabilities that can conduct such research. • **Research prioritization procedure:** Identification and categorization of potential research opportunities based on their relevance to proposed Deemed-to-be University's strategy and feasibility. • **Research Fund Management procedure:** Development and management of research contracts and funding milestones to manage revenue and expenditure related to the proposed Deemed-to-be University's research programs/projects. • **Research Quality Management procedure:** Development and communication of the Quality Metrics and evaluation criteria of ongoing research programs. • **Externally Sponsored research projects and programs:** Defines the policy and procedures related to the submission and administration of externally sponsored research projects and research programs.

Area	Details
Impact and Commercialization	• **Research Impact Assessment procedure:** Framework for evaluating the impact of research project and determine if the research warrants a nomination for an impact award to recognize the benefit of its output. • **Research Outcome Commercialization procedure:** Process to manage realization of research output that may exploited for profit and sold to the market (i.e., Technology, product). • **Commercial Relationship Management procedure:** Describes the activities to be carried out to identify and select potential partner(s) to collaborate with on commercializing research output.
Partnerships and Consulting Services	• **Consultancy Contract Management:** Management procedure for consultancy contract requests for work of professional nature, from University's faculty, for external organizations in exchange of a fee. This will solve the industry problems. The proposed Deemed-to-be University's faculty will leverage the sate-of-the art lab infrastructure and will solve the industry problems. • **External engagements and partnerships:** Seeking external research collaborations for revenue diversification and access to industry and government know-how and practical needs.
Intellectual Property	• **Governance:** Dedicated department in organization chart (example: Technology Transfer Office - TTO) dedicated to providing guidance on IP management and technology transfer. • **Disclosure:** The community members disclose all intellectual property, in which the proposed Deemed-to-be University's has an ownership interest. • **Intellectual Property Protection:** Through the TTO, seeks to protect the commercially attractive IP.
Research Laboratories	• **Equipment Selection & Utilization:** To ensure that equipment selected for purchase is the best suited for research needs, cross-functional and non-redundant. • **Research Lab Usage:** Guidelines for usages of research laboratories, including research capital equipment purchases, equipment training and space utilization to support the strategic aims and objectives of the proposed Deemed-to-be University. • **Equipment Training:** Provide a research laboratory training website detailing all scheduled training sessions in compliance with local and international rules and regulations.

Table 7 : Measures for achieving excellence in research.

7.3.6 15 Year Strategic Plan for Applied Research

1 – 5 Year Plan
• Set up the core research infrastructure (labs and centers). • Develop state-of-the art research park with facility to accommodate 50 companies. • Develop strategic partnerships with industries, government bodies, and academic institutions. • Identify and refine key research themes within focus areas.

6 – 10 Year Plan
• Closely work with industry to solve industry problems using lab infrastructure. • Inception of PhD and fellowship programs • Broaden industry collaborations to include international partners. • Launch interdisciplinary research projects across multiple focus themes. • Scale up funding opportunities through national and international grants.

11 – 15 Year Plan
• Establish the proposed Deemed-to-be University as a global leader in engineering and technology research. • Achieve major breakthroughs in key focus areas such as AI-driven manufacturing, sustainable energy solutions, and advanced robotics. • Strengthen the proposed Deemed-to-be University's role as a thought leader in India's research ecosystem. • Foster commercialization of research outcomes through patents, startups, and industry collaborations. • Consolidate global partnerships, positioning the university as a key player in international research networks.

Table 8 : 15 Year Plan for Applied Research

In conclusion, the strategic vision for applied research is geared towards creating a vibrant and responsive research ecosystem. By aligning with national priorities and regional goals, and fostering a culture of practical, solution-driven research, the proposed Deemed-to-be University aims to make significant contributions to both local and global knowledge landscapes and position itself as a leader in research excellence and innovation.

7.4 Plan for Information and Communication Technology (ICT) Infrastructure

This section details the strategic plan for developing robust Information and Communication Technology (ICT) infrastructure at the proposed Deemed-to-be University. It encompasses the design, implementation, and management of ICT systems that will support academic, administrative, and other functions. The plan aims to integrate cutting-edge technologies to enhance learning experiences, streamline operations, and foster innovation. By aligning with global best practices and emerging trends, the proposed Deemed-to-be University seeks to create a technologically advanced environment that meets the needs of all stakeholders.

In the 21st century, Information and Communication Technology (ICT) plays a critical role in shaping the digital economy. ICT is a transformative force that is redefining the operations of modern educational institutions. It enhances access, equity, and quality of education, providing institutions with tools to deliver high-quality learning experiences anytime, anywhere. Institutes must leverage ICT to equip students for a rapidly evolving world, ensuring that their learning experience is dynamic, engaging, and technologically aligned with global trends. Digital ICT allows institutions to provide a more contemporary and engaging learning experience, enhance collaboration and communication among students and faculty, streamline administrative tasks, and equip students with the technical skills necessary for their future careers. Moreover, ICT is foundational to fostering essential 21st-century competencies like Communication, Collaboration, Creativity, Critical Thinking, and Problem-Solving. With effective digital support such as websites, mobile apps, portals, and course registration platforms, institutes can not only attract prospective students but also address the needs of their current student body. Beyond the visible systems, there is an overarching digital infrastructure that supports university operations enabling smarter education. This type of digital infrastructure is not visible to all users but crucial to bringing together the infrastructure that enhances student experiences.

7.4.1 Vision and Objectives

A digital vision is essential to implement long-term infrastructure in the proposed Deemed-to-be University. This will require secure and scalable systems to adapt to the ever-changing education landscape and operate on the same platform rather than in silos. The system will foster a unified platform for operations rather than working in silos. With ICT infrastructure, the proposed Deemed-to-be University will be better positioned to meet the growing demand for ICT skills and technological advancements, ensuring that their students are future ready.

The vision is to establish the proposed Deemed-to-be University as a leading institution equipped with cutting-edge ICT infrastructure, fostering a culture of innovation, collaboration, and lifelong learning. The proposed Deemed-to-be University will be able to achieve this vision by taking the following measures:

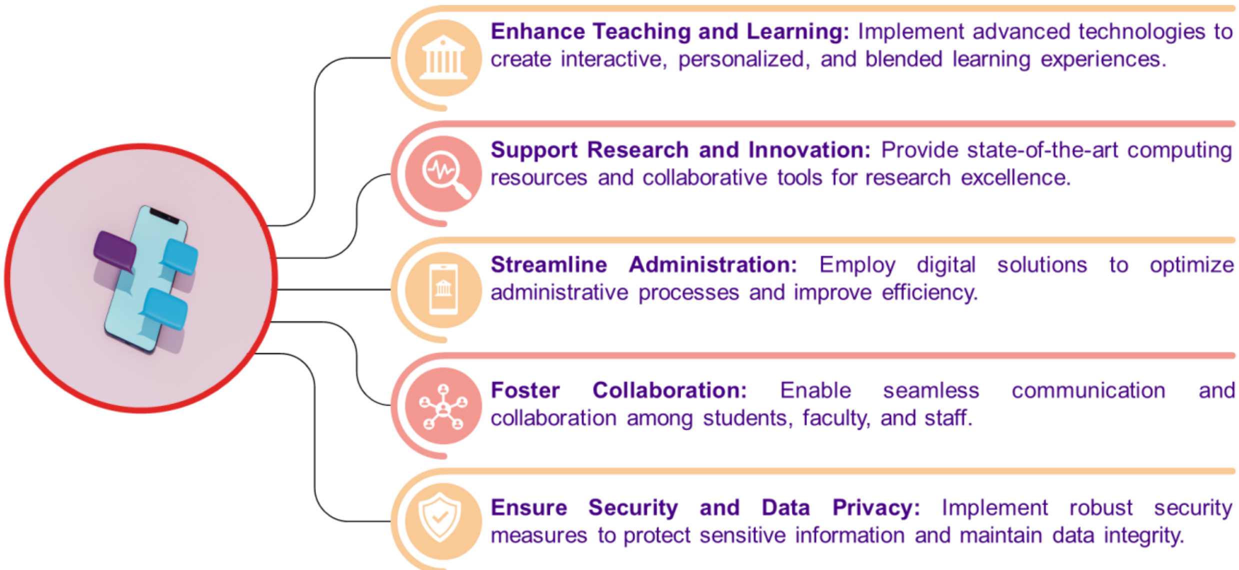

Figure 22 : Measures for achieving the vision for ICT Infrastructure

To achieve the above vision the components mentioned below will be introduced at the proposed Deemed-to-be University.

Area	Key Component of ICT
Enhanced Teaching and Learning	
ICT for Academic Purposes	• **Smart Classrooms:** Equipped with ICT-enabled teaching aids, connected to the network for accessing online resources. • **Learning Management System (LMS):** Integrated platform for managing courses, assignments, and learning materials. • **E-Library:** Digitized library with access to online journals, e-books, and research databases. • **AR/VR Labs:** Augmented and virtual reality labs equipped with motion tracking, haptic devices, and other advanced technologies.
Learning Ecosystem	• **Digital Experience Platforms (DXP):** A unified platform for delivering personalized university experiences across multiple channels. • **Content Studios:** Facilities for designing and recording educational content, hosted on cloud servers for online delivery
Support Research and Innovation	

Area	Key Component of ICT
ICT for Research and Innovation	• **High-Performance Computing (HPC):** Centralized system for intensive computational research tasks. • **Research Data Storage:** Secure storage for research data with backup and archiving systems.
Streamline Administration	
ICT for Administrative Purposes	• **Enterprise Resource Planning (ERP):** Comprehensive system for managing academic, financial, and administrative activities. • **Online Evaluation and Examination Systems:** Systems for conducting remote exams and providing auto-evaluation tools.
Foster Collaboration	
ICT for Communication and Outreach	• **University Website:** A responsive, user-friendly platform providing information on courses, admissions, and news. • **Mobile App:** A one-stop solution for students and faculty to access course materials, notifications, and administrative services.
Sustainability and Expansion	• **Green ICT Practices:** Adoption of power-efficient servers, workstations, and network devices to reduce energy consumption. • **Living Labs: T**he campus will act as a living lab for sustainability, with IoT devices monitoring environmental conditions. • **Scalability:** ICT infrastructure will be designed to scale with the university's growth.
Ensure Security and Data Privacy	
Network Infrastructure	• **Campus-Wide Wi-Fi**: High-speed, secure wireless network coverage across academic and residential areas. • **Fiber Optic Backbone:** A high-bandwidth, low-latency network backbone connecting all buildings to a central data center. • **Data Center:** State-of-the-art facility housing servers, storage systems, and network devices, with redundant power supplies and backup facilities.
Internet and Bandwidth	• **High-Speed Internet Connectivity:** Dedicated leased lines with scalable bandwidth to support institutional demands. • **Firewall and Network Security:** Strong firewall systems and VPNs for secure off-campus access.
Security and Data Management	• **Data Security:** Implementation of encryption, access controls, and regular audits to protect academic, financial, and personal data.

Area	Key Component of ICT
	• **Access Control:** Facial recognition-based devices for managing campus security. • **Data Backup and Disaster Recovery:** Automated data backups and a comprehensive disaster recovery plan to ensure data integrity.

Table 9 : Components of ICT

7.4.2 Approach

The proposed Deemed-to-be University prioritizes both innovation and accessibility, hence the ICT's strategic vision is driven by the integration of smart technology in infrastructure and operations of the proposed Deemed-to-be University. This is not only essential for delivering quality education to a broad audience but also for ensuring operational efficiency and sustainability through cutting-edge technological advancements.

Integration in Infrastructure and operations

The proposed Deemed-to-be University aims to establish a smart campus to maximize student experience and learning. Smart campuses are being established around the world with digital solutions being one of the most powerful and cost-effective additions to

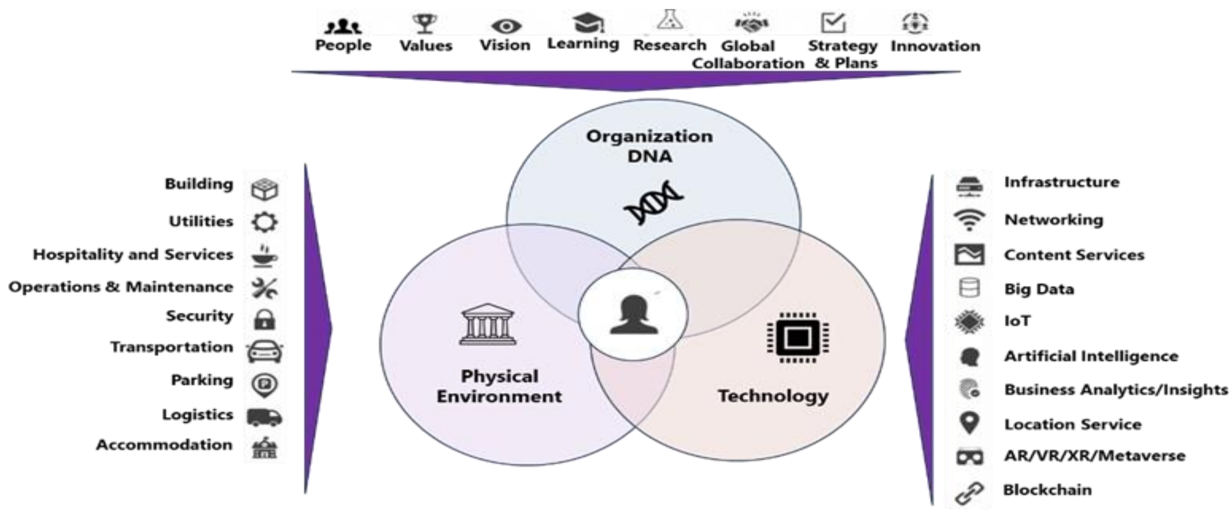

Figure 23 : Elements of a Smart Campus Design

the smart campus full tool kit. A Smart Campus is defined by the collaborative approach of user's expectations, organizational DNA, technology, and process to enable a consistent, engaging experience. A smart campus complements physical environments, services and utilities with technology chosen with a purpose.

In higher educational space the expectations of multiple stakeholders like students, academic staff, managerial staff, admin staff and visitors need to be catered by seamlessly integrating technology and physical environment. To understand how buildings are becoming SMART, the proposed Deemed-to-be University conducted a study wherein the team visited 26 smart infrastructures across India, China, USA, and Singapore. The site visited are highlighted below:

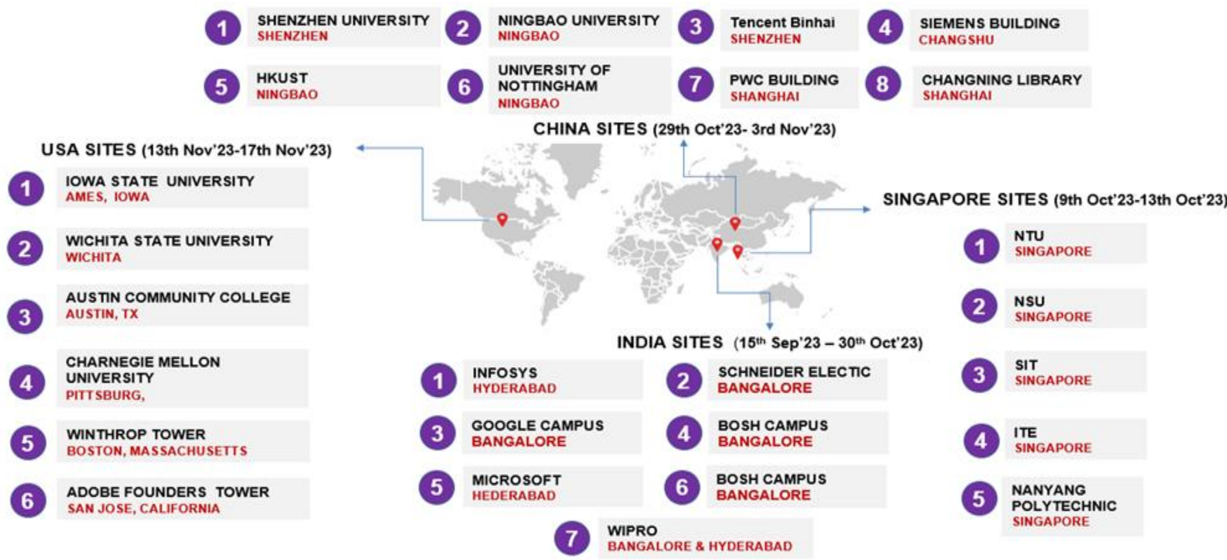

Figure 24 : Sites visited across world for benchmarking Smart Campus practices.

The study identified the below identified key areas of intervention for defining a Phygital campus:

- **User Experience:** A campus that creates an enriching and rewarding user experience by leveraging innovative technology, blending the digital and physical campus.
- **Intelligent infrastructure:** A campus with the infrastructure and technology to be open, connected, adaptable and future-proof.
- **Safety and Security:** An agile and adaptable campus that supports discovery, fosters innovation, and builds collaboration.
- **Health and wellbeing:** A campus that is healthy, welcoming, and safe; that optimizes the physical environment and working practices to enhance wellbeing and productivity.
- **Sustainability and optimization:** A sustainable campus that optimizes the use of its resources. A campus that is energy efficient, enabling the use of a sustainable built environment
- **Operational Efficiency:** A campus that lowers utility costs and optimizes use of spaces by digitally monitoring, usage, occupation, environment management in real-time.

The proposed Deemed-to-be University's ICT infrastructure will be built around a digital-first philosophy incorporating the above-mentioned key areas of intervention, ensuring that immersive learning elements such as AR/VR labs, cyber-physical systems, virtual simulation rooms, and smart classrooms are seamlessly integrated into the academic environment. This infrastructure will enable continuous learning across classrooms, labs, industry settings, and beyond, ensuring access to quality education from any location.

Key technologies like cloud-based Learning Management Systems (LMS), Student Information Systems (SIS), and Enterprise Resource Planning (ERP) systems will support both academic and administrative operations, ensuring robust internal and external reporting, dashboarding, and monitoring.

Campus security will be enhanced through AI-enabled CCTV cameras with cloud storage, and access control will be managed via facial recognition systems in labs, classrooms, and restricted areas. Additionally, a comprehensive campus-wide Wi-Fi network will support IoT devices in labs, facilitating real-time data monitoring and control.

The ICT ecosystem comprises of multiple interdependent framework elements. These elements are outlined below:

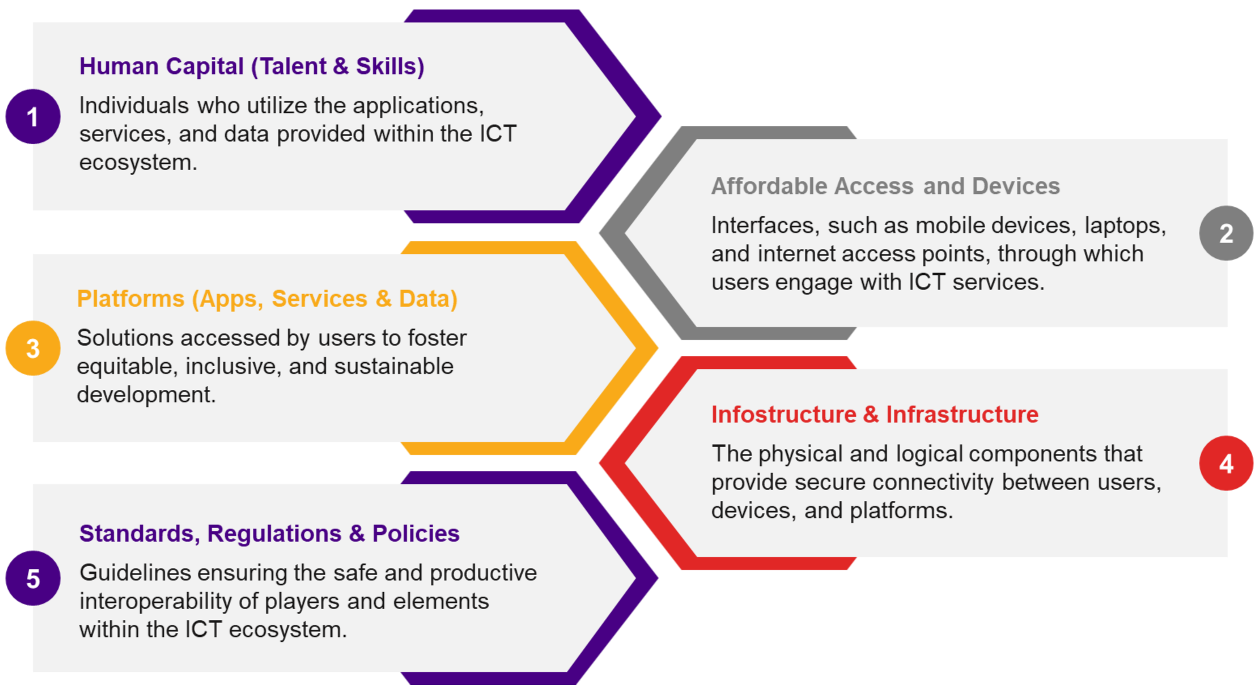

Figure 25 : Interdependent elements of ICT Infrastructure Framework

7.4.3 15 Year Strategic Plan for ICT Implementation

The implementation will be spread over 15 years, starting with foundational ICT infrastructure development, followed by the rollout of advanced technologies, including AR/VR labs, AI-enabled tools, IoT integration, and smart campus systems. The plan will culminate in the adoption of cutting-edge technologies like quantum computing and robotics to further enhance the university's operations and educational offerings.

1 – 5 Year Plan

- In the initial year the focus will be on developing a strong ICT infrastructure foundation on campus which includes installing and upgrading of basic networking, connectivity, and storage infrastructure.
- Implementation of a robust learning management system (LMS) to access, record, monitor and analyse student performance across different subjects and academic sessions, helping student to develop their personalized learning pathways.
- Implementation of organization-wide ERP modules for efficient management and tracking of organization critical activities across different verticals such as HR, Finance, procurement, budgeting etc.
- Implementation of organization-wide cloud computing infrastructure which will support greater scalability, flexibility, and cost efficiency. This will allow organizations to use storage space flexible way at cloud server and can be accessed through the internet.
- Installation of digital signages and interactive dashboards throughout the campus to provide live updates regarding any events and news of the institute to the major stakeholders such as students, faculty, staff etc.
- Development of virtual lab infrastructure through installation of AR/VR and virtual simulation devices & software along with inclusion of virtual labs and simulation in the curriculum. It will improve the hands-on experience of the students.
- Develop and rollout of a mobile application (one-stop solution for all major stakeholders) for students, faculty, and staff through which each stakeholder can access the required service at any time. For example, students can browse through any study materials, previous performance records etc.
- Extensive implementation of AI/ML technology to improve teaching and learning outcomes along with personalized adaptive learning experiences for students.
- Initiation of a robust mobile device management program under which the proposed university will develop strong cybersecurity infrastructure & policy along with a mobile device distribution policy. The program will enable the institute to remotely manage and update mobile devices, enforce security policies, and track device usage.
- Implementation of AI-enabled chatbot/virtual assistance for providing 24*7 assistance to all the stakeholders.
- Automate routine processes like attendance, grading and communication wherever possible.
- Ensure timely maintenance of industry scale labs and smart classrooms

6 – 10 Year Plan
• Implement a smart campus technology system that will help in capturing real-time data on energy consumption, occupancy rates, carbon footprint and other important information enabling the proposed university to optimize its resources and improve sustainability. • Design and implement advanced cybersecurity protocol and infrastructure to minimize cybersecurity threats. • Integration of IoT devices and sensors across campus infrastructure to monitor the usages and optimize the performance. • Explore various usages of blockchain and implement the technology to create a secure and decentralized system for managing student records and academic credentials. • Use of digital twin and predictive maintenance technology for maintaining the university infrastructure

11 – 15 Year Plan
• Develop a plan and integrate quantum computing into the proposed university's infrastructure to improve operational efficiency. • Design and integrate robotics and automation across all campus infrastructure, creating an immersive experience for students, faculty, and all other stakeholders. • Extensive use of IIoT devices and sensors to track the carbon footprint and make the campus a net-zero campus.

Table 10 : 15 Year Plan for ICT Infrastructure

In conclusion, the strategic plan for ICT infrastructure is pivotal to the proposed Deemed-to-be University's mission of providing a modern, efficient, and innovative educational environment. By implementing state-of-the-art technologies and ensuring seamless integration across all functions, the proposed Deemed-to-be University aims to enhance the overall experience for students, faculty, and staff. This commitment to technological excellence will not only support current needs but also position the proposed Deemed-to-be University at the forefront of digital transformation in higher education.

7.5 Plan for Infrastructure Development

This section outlines the comprehensive infrastructure development plan for the proposed Deemed-to-be University, detailing the phased approach for both the transitory and main campuses. It covers the strategic planning, design, and construction processes aimed at creating state-of-the-art facilities that support the proposed Deemed-to-be University's academic, applied research, and administrative functions. The plan emphasizes sustainable development, modern architectural standards, and the integration of advanced technologies to ensure a conducive learning and working environment. By addressing immediate needs through the transitory campus and long-term goals with the main campus, this section provides a roadmap for the university's physical growth and development.

NAMTECH has set up its transitory campus, strategically located within the research park of the IIT Gandhinagar campus since September 2023. Occupying leased space of a total of 1,00,148 sq. ft [net usable area] till 2032, this state-of-the-art facility offers cutting-edge infrastructure. Following the space agreement signing in August 2022 and the inaugural ceremony on November 17, 2022, work progressed on setting up laboratories, active learning spaces, resource centers, and administrative offices. Renowned architect firm ARCOP designed the interiors, collaborating with ITE Singapore to optimize classroom and laboratory layouts for an enriching learning experience.

Figure 26 : Current NAMTECH Campus at IIT Gandhinagar

The integration of technology and tailored pedagogy is exemplified in the proposed Deemed-to-be University's current campus as learners and faculty utilize interactive touchscreen boards within flexible seating arrangements, thereby catering to the specific needs of each session. Additionally, the state-of-the-art laboratories are meticulously designed for smart manufacturing and industrial automation, demonstrating a commitment to preparing learners for the forefront of technological advancements. The educational environment is meticulously crafted to inspire, innovate, and ensure a holistic learning experience.

Figure 27 : Labs at current campus at IIT Gandhinagar

Figure 28 : Labs at the current campus at IIT Gandhinagar

Eight laboratories are currently operational and equipped with cutting-edge tools and precision equipment technologies, with additional facilities under development. The workshops and laboratories feature industry-grade machinery and immersive AR/VR technologies. Specialized laboratories, including those for CAD, additive manufacturing, robotics, and cyber-physical systems, have been established in collaboration with industry leaders such as FESTO, Schneider, and LMW. These advanced facilities mimic the real-life factories thereby providing students with an immersive, hands-on learning experience, enabling them to fully utilize the available resources.

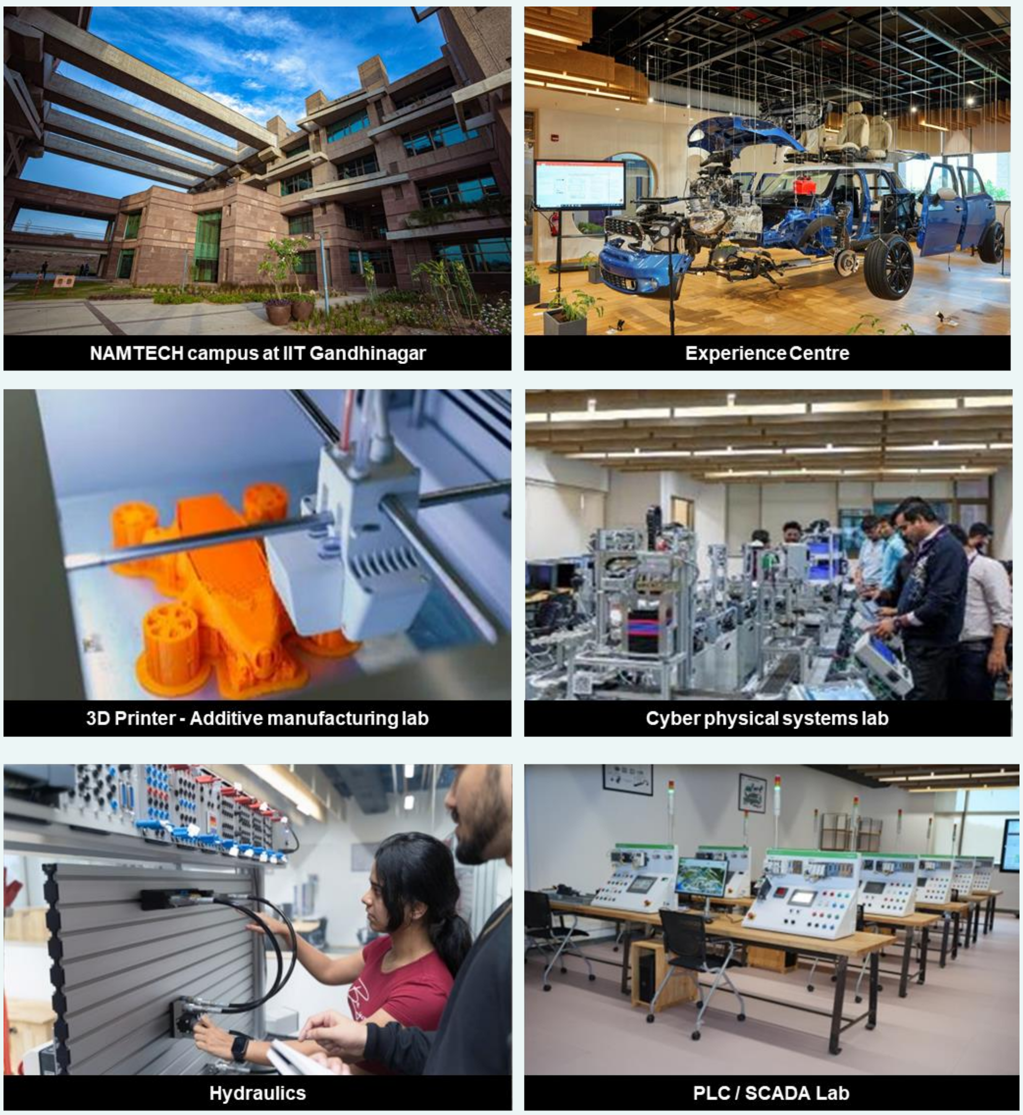

Figure 29 : NAMTECH Campus at IIT Gandhinagar

7.5.1 Concept Design

The campus of the proposed Deemed-to-be University is envisioned as a smart, technological, authentic learning campus incubating advanced engineering excellence in emerging technologies, fostering experiential learning-by-making and promoting sustainability, creativity, well-being, community, collaboration, and career-ready graduates through state-of-the-art facilities.

The plan is to optimize land usage while exploring different forms of spatial compactness, circulation efficiency, and spatial flexibility. The campus design will have a deep-rooted creative-design concept, with sensibilities, meaningful design planning and an architecture that will inspire and nourishes mind- body holistically. These will be the principles that contribute to creating a healthy and inspired learning environment. Without compromising on the academic area, the site will be developed such that there are open spaces, walking corridors across. These corridors will connect the social center, common facilities, sports centers, pause points (which could be developed as small eateries also) for better people networking. Additionally, they will optimize human interaction which will develop a sense of community living which is main essence of any education campus development.

In early 2023, the proposed Deemed-to-be University initiated the process to develop a broad concept for the main campus. Two international consultants were approached to work on the concepts for the main campus. As an outcome, the concept formulated was termed “Mati”. The concept addresses the built requirement, zoning, and sustainability in its own way.

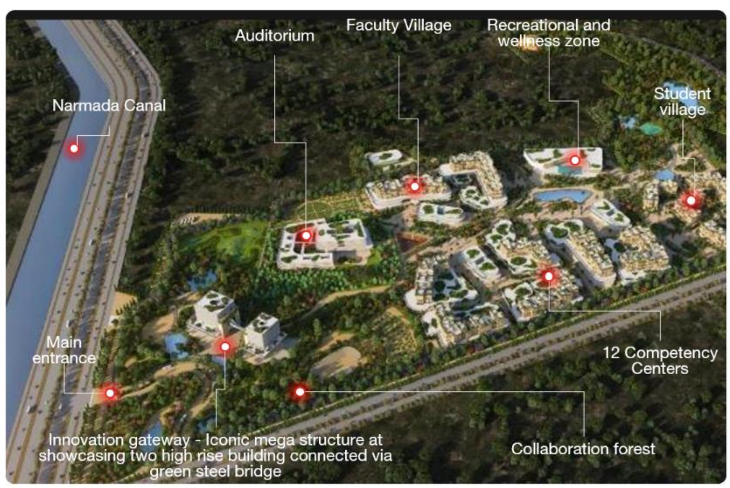

Figure 30 : Main Campus Concept - MATI

The concept of ‘Mati’ advocates living learning concept, high on biodiversity, Urban Agriculture, and iconic signature building with an Innovation Gateway that is proposed to be built on a combined structure of 2 lakh square feet. An extraordinary 7 to 9 story building celebrating the art of technology through a state-of-the-art gateway and cubical digital screens that can reach up to a height of more than 50 meters from ground level is indicated in the concept. The innovation gateway art piece is an opportunity to showcase the new steel and to expected become the world’s largest gateway with an approximate span of around 35 to 40 meters between supports. The design has been inspired by the local context of *"Darwazas"*, kites' festival of Ahmedabad. This building represents the gateway to the future of education and innovation in manufacturing where students are prepared for the new revolution 4.0, real work opportunities and a responsible holistic lifestyle. Additionally, there is a 14-meter-high immersive experience room present at the Welcome Centre.

7.5.2 Key Principles of Concept Design

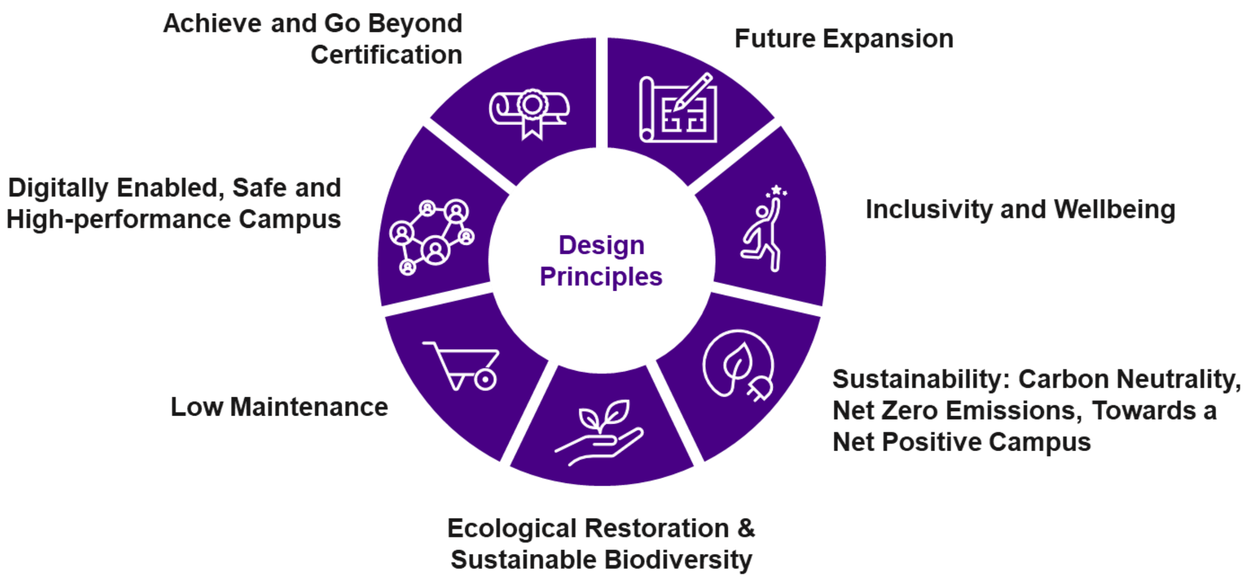

Figure 31 : Key principles of concept design

1. Design for Inclusivity and well-being

The proposed Deemed-to-be University's campus will create a nurturing and inclusive environment that supports academic pursuits and enhances the quality of life for all who interact with it. The campus will ensure that designs are accessible, usable, and inclusive to the widest possible range of people, regardless of age, ability, or other characteristics. It will promote health, safety, and belonging while embracing sustainable and innovative design principles.

- **Design for Active Outdoor Life**: By incorporating green spaces, gardens, walking paths, and recreational areas, the campus will provide opportunities for relaxation, physical activity, and connection with nature.
- **Design for Spontaneous interactions**: By facilitating these interactions to happen informally between students, faculty, and staff, the proposals will provide valuable opportunities for learning as well as personal development, social growth, encountering diverse perspectives, mentorship, networking, and community building.

- **Fitness Facilities**: By including fitness centers, sports fields, and indoor/outdoor sports facilities, the campus will encourage physical activity and promote a healthy lifestyle.
- **Meditation and Reflection Areas**: Dedicated meditation, mindfulness, and personal reflection spaces will help the institution support mental well-being and stress reduction.
- **Health Services**: Allocating space for health clinics and counselling centers, the campus will provide medical care and mental health support for the campus community.

2. Design for Sustainability and Living Labs: Carbon Neutrality, Net Zero Emissions, Towards a Net Positive Campus

The campus design and operations will meet carbon neutrality and net-zero emissions and work towards being a net-positive campus. The campus will showcase innovative design solutions, featuring durable and low-maintenance materials and striking architecture that embodies the institution's unique spirit, setting it apart from traditional campuses and showcasing an innovative yet transcendental design that can represent the legacy of one of the first institutions of its kind.

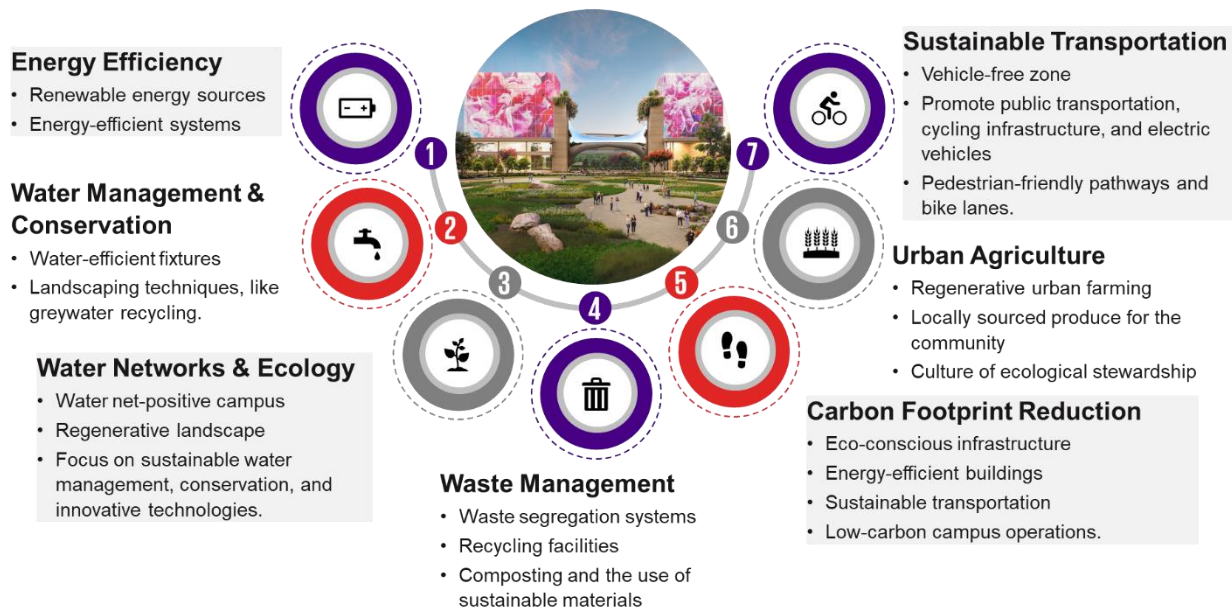

Figure 32 : The Living Lab

3. Ecological Restoration and Sustainable Biodiversity

The campus will be thoughtfully designed to coexist with and restore its ecosystem, fostering a mutually beneficial relationship with the environment and learners. It respects the location's natural beauty, contributing to land restoration, water preservation, and biodiversity. This design is a model for enhancing the environment through technology and biophilic design. This biophilic design will include elements that nurture the innate human-nature connection, environmental features, light and space, and natural shapes and forms. It will also encompass a unique connection to the place, climate and culture and allow for sufficient and frequent human-nature interactions in both the interior and exterior of the project to connect majority of occupants with nature directly.

4. Design for Low Maintenance

The design will prioritize sustainability and efficiency by using durable, low-maintenance materials, native plants for minimal irrigation, and strategic infrastructure placement for easy maintenance, allowing more resources for technology, equipment, software, academics, and student well-being.

5. Design for a Digitally Enabled, Safe and High-performance Campus

The campus design will integrate cutting-edge technology to optimize operational efficiency for a digitally enabled, safe, high-performance campus. Smart surveillance systems, access control, and real-time monitoring are to be provided for a secure environment. Additionally, advanced data analytics and IoT to be integrated to facilitate energy management, predictive maintenance, and resource allocation, ensuring a high-performing, sustainable campus infrastructure.

The campus will seamlessly incorporate technology and digital resources into the educational environment to enhance the teaching and learning experience, streamline administrative processes, and create a more connected, efficient, and sustainable campus ecosystem.

6. Design to Achieve and Go Beyond Certification

The design will help seek certifications from reputable organizations like the WELL Building Institute (WELL) and the International Living Future Institute (ILFI) to demonstrate the commitment to high. Aspiring consultants must be familiar with rating systems such as WELL Certification, ILFI Certification, LEED Certification, SITES Certification, and IGBC Certification.

7. Design for Future Expansion

The plan for the campus will address phased development, which is strategic and incremental. Phased development allows efficient management, budgeting, and flexibility to adapt to changing needs and circumstances while maintaining the campus's overall vision and quality. Each phase will be carefully planned and executed, building upon the previous one and ultimately leading to successfully realizing the campus's long-term goals and objectives.

7.5.3 Design Competition Process

To further build on the concept design developed, i.e., Mati, the proposed Deemed-to-be University has sought the services of an Architecture and Master Planning Design firm with extensive national / global experience in projects of a similar nature through an equitable and transparent Design Competition. To manage and execute the competition, the proposed Deemed-to-be University has engaged CRDF (The CEPT Research and Development Foundation), CEPT University - a renowned academic institution recognized for its excellence in architecture, planning, design, and related disciplines.

The Design Competition was held in two stages, where the deliverable of the first stage was to primarily focus on the master plan and cover only the broad expression of architecture for a small portion of the phase-1 buildings. The second stage, however, will include a detailed architectural design brief regarding built-up areas, types of spaces and qualitative expectations for the entire phase-1 buildings, which may include some aspects of student housing as well. The design competition's focus was to evaluate services for the Master Plan Design, Infrastructure Design, Landscape Design and Architecture Design of phase-1 buildings.

Figure 33 : Details for design competition for main campus

The design proposals are expected to demonstrate a contextual sensibility covering the following aspects: Vision alignment, Performance, Innovation, Aesthetics, Phasing, Smart Technology Integration, and Sustainable Development.

7.5.4 Main Campus Development Plan

The main campus for the proposed Deemed-to-be University will be developed over a period of 15 years. There is approximately 150 acres of land available for this extensive project. In the first phase, development will focus on around 30 acres, with approximately 1 million square feet of construction planned over a 3 - 5 years period. This initial phase will feature state-of-the-art technology-enabled classrooms, workshops, high-tech laboratories, a library, computer labs, an auditorium, residential facilities, and other essential amenities to support a comprehensive educational environment.

Future development plans will utilize the remaining land to further expand the educational facilities, ensuring that the institution remains at the forefront of educational innovation and excellence. The phased approach to development will allow the sustainable and strategic growth, meeting the needs of its students and faculty over the long term.

The proposed Deemed-to-be University's campus area will be divided broadly into two functional areas namely – academic and non-academic areas. The academic area shall have an instructional area and an administrative area. The non-academic area will have a residential area, sports complex, and auditorium, utilities & common facilities. The campus infrastructure shall be in accordance with the norms and standards prescribed by the UGC and the statutory bodies.

The proposed Deemed-to-be University's campus is planned to be constructed in three phases. In the first phase, the plan is to build a capacity of 2,425 students on 31.5 acres of land. A detailed list of indicative spaces to be built in the first phase is given below:

S.no	Base Data	Value (in Numbers)
1	**Plot Area (acres) – Land**	149.8
2	**Phase 1 Land Area (acres)**	31.5
2	**Student Capacity (Academic)**	**2,425**
3	**Total number of Schools**	**4**
4	**Typical Cohort Size**	**30**
4	**Total Nos. of Cohort (Divisions)**	**82**
5	**Total Nos. of Courses**	**15**
6	**Nos. of Cohort (Divisions) per course**	**5**
	Female Learners (35%)	849
	Male learners (65%)	1,576
7	**Total Hostel Capacity**	**2,425**
	No. of Female Hostels (300 capacity each)	3
	No. of Male Hostels (300 capacity each)	5
8	**Total number of Faculty (1:15)**	**162**
9	**Total number of Staff (1.1 times Faculty)**	**178**
10	**Number of Faculty/ Staff Housing Units (for 90%)**	**306**
	2 BHK	229
	3 BHK	76

Table 11 : Indicative area and capacity of main campus

The built-up area for the phase-1 development is given in the below table:

#	Space	# Units	Area per unit (Sq. Mts)	Per Unit BUA in (Sq. Mts)
A	**Instructional Area (INA)**			14184.0
1	Classrooms (30 size cohort)	41	35.0	1435.0
2	Labs	90	.70.0	6300.0
3	Tutorial Rooms (25% of classrooms)	10	35.0	359.0
4	Workshop (Maker Space)	4	200.0	800.0
5	CAD Centre/Drawing Hall	4	132.0	528.0
6	Computer Centre	4	150.0	600.0
7	Seminar Hall	1	132.0	132.0
8	Language Laboratory	8	35.0	280.0
9	School of Social Impact	1	300.0	300.0
10	Resource Centre and Library	1	2100.0	2100.0
11	International Testing Centre	1	300.0	300.0
12	Academic & Industry Partnership Centres	1	750.0	750.0
14	WorldSkills Centre	1	300.0	300.0
B	**Admin / Office Area (ADA)**			6000.0
15	General Administration + Offices	1	3900.0	3900.0
16	Student support	1	300.0	300.0
17	Student Services	1	300.0	300.0
18	Career & Placement Cell	1	300.0	300.0
19	Information Technology (IT) Services	1	300.0	300.0
20	Finance Department	1	150.0	150.0
21	Human Resource	1	75.0	75.0
22	Public Relations	1	150.0	150.0
23	Legal and Compliance	1	75.0	75.0
24	Office of the Registrar	1	300.0	300.0
25	International Programs and Services	1	150.0	150.0

#	Space	# Units	Area per unit (Sq. Mts)	Per Unit BUA in (Sq. Mts)
C	**Amenities Area (AMA)**			4000.0
	Sub Total (INA + ADA+ AMA)			24184.0
D	**Access and Circulation Area (ACA)**			6046.0
	Total INA+ADA+AMA+ACA			30230.0
E	**Recreational Area + Others**			2435.0
26	Student Wellness and Sports Facility	1	2000.0	2000.0
	Outdoor Basketball Court	4		
	Outdoor Football field	1		
27	Community Exposure and Engagement	1	100.0	100.0
28	Auditorium Complex (300 capacity)	1	335.0	335.0
F	**Accommodation Area**			59800.5
29	Student Accommodation (300 capacity each)	8	2250.0	18187.5
30	Mess & Kitchen Facility	2	945.8	1891.5
31	Faculty & Staff Accommodation (2BHK)	229	125.0	28645.3
32	Faculty & Staff Accommodation (3BHK)	76	145.0	11076.2
	Total			**92,465.5**

Table 12 : Detailed indicative area for different space settings and its capacity

In the second and third phases of development, the proposed Deemed-to-be University will significantly expand its infrastructure to accommodate additional student capacity. The second phase will focus on building facilities to support 3,600 students, while the third phase will further increase capacity for an additional 4,200 students. These phases will include the construction of new academic buildings, residential facilities, and recreational areas, ensuring that the university can continue to provide a high-quality educational experience as it grows. This planned expansion will not only enhance the Deemed-to-be University ability to serve a larger student body but also ensure that it remains at the forefront of educational innovation and excellence.

7.5.5 Recreational and other facilities

The proposed Deemed-to-be will encompass thoughtfully designed recreational facilities and common areas to foster a vibrant and holistic campus experience. With a total built-up area of 4,326.5 Sq. Mts dedicated to these facilities, this space will provide students with diverse opportunities for recreation, wellness, and social engagement.

These recreational and common areas are integral to creating a balanced, supportive, and engaging campus environment, ensuring that students have the necessary facilities to thrive academically, physically, and socially.

A. **Sports Facilities:** A strong emphasis on sports and physical fitness is integral to the institution's vision of developing well-rounded individuals. The campus sports facilities include:

    - **<u>Outdoor Basketball Court:</u>** A high-quality basketball court will provide a space for students to engage in team sports, fostering a spirit of camaraderie and healthy competition.

    - **<u>400-Meter Track and Football Field:</u>** The athletics track, designed to professional standards, will encircle a football field that meets international benchmarks. These facilities will support a range of athletic activities and events, promoting fitness and providing an avenue for students to develop their athletic abilities.

    - **<u>Indoor Sports:</u>** The proposed Deemed-to-be University will cater to a range of indoor sports, including badminton, table tennis, and a dedicated fitness center. Equipped with modern exercise equipment and training areas, the indoor sports complex will ensure year-round access to sports and fitness activities.

B. **Auditorium:** The campus auditorium will serve as a central venue for academic ceremonies, guest visits, cultural programs, and student activities. Designed to accommodate a large audience, the auditorium will feature state-of-the-art audio-visual technology, comfortable seating, and excellent acoustics to facilitate both educational and cultural events. The auditorium aims to foster a dynamic and engaging environment, supporting both student-led and institutional events.

C. **Student Wellness Center:** The Student Wellness Center will focus on the mental and physical well-being of the campus community. The center will offer a range of services, including counseling, workshops on stress management, yoga, and meditation spaces. Additionally, a wellness team comprising mental health professionals and wellness trainers will be available to support students through various challenges. The center will serve as a hub for nurturing a healthy lifestyle, encouraging students to prioritize their mental and physical health.

D. Content Studio: The proposed content studio on campus will be the breeding ground for creativity and innovation. With state-of-the-art equipment and latest technology, the studio will support a myriad of activities, ranging from photography, video production, podcast recordings, to digital art creation. Designed to inspire, the studio aims to provide an engaging and collaborative environment where students can bring their ideas to life, enriching both their academic journey and personal development.

E. **Labs:** The on-campus labs are envisioned as the epicenter of technical learning and experimentation. They will be equipped with high-tech equipment and state-of-the-art technology, providing students with practical exposure and experience. From science to computing labs, each science hub will foster a nurturing environment conducive for research, discovery, and innovation. These labs aim to bridge the gap between theoretical knowledge and real-world applications.

F. **Library:** The library at the proposed campus will be more than just a repository of books; it will be a hub for knowledge, exploration, and intellectual expansion. Envisioned to nurture a culture of reading and lifelong learning, the library will feature extensive collections, quiet study spaces, digital resources, and comfortable seating areas. It also aims to promote collaborative learning through group study spaces. The library's primary goal is to support academic success while fostering a deep appreciation for knowledge and scholarship.

G. **Seminar and Meeting Halls:** The seminar and meeting halls on campus will be outfitted with advanced audio-visual technology to support a wide range of activities. From lectures, and workshops, to meetings and group discussions, these spaces are designed to facilitate both formal and casual interactions. These venues aim to provide an environment that encourages active learning, fosters dialogue, and facilitates vibrant discussions among students, faculty, and guest speakers.

H. **Café/Canteen:** Envisioned as the central gathering spot-on campus, the cafe/canteen will be a vibrant space for students to relax, refuel, and socialize. Designed with a contemporary ambiance, the cafe will offer a diverse menu catering to various dietary preferences. It promises to provide a comfortable environment where students can take a break from their rigorous academic schedules, network with peers, and create lifelong friendships. The canteen not only aims to satisfy students' hunger but equally to stimulate social interaction and camaraderie.

I. **Open Spaces:** Ample open spaces will be integrated throughout the campus, providing areas for relaxation, study, and informal gatherings. These include landscaped gardens, shaded seating areas, and open lawns that encourage social interaction and provide a natural respite. Additionally, these spaces will be designed to be an aesthetically pleasing environment that promotes relaxation and mindfulness. Open spaces will also host occasional student-led activities, such as art installations, cultural fairs, etc.

The images shown are for illustration purposes only. The actual construct of the campus facilities may vary from the illustrated image

7.5.6 15-Year Strategic Plan for Infrastructure Development

1 – 5 Year Plan

- Development on around 30 acres of land, with approximately 1 million square feet of construction. This initial phase will feature:
    - state-of-the-art technology-enabled classrooms
    - workshops
    - high-tech laboratories
    - library
    - computer labs
    - auditorium
    - residential facilities
    - other essential amenities to support a comprehensive educational environment.
- Integrate elements of sustainability into the infrastructure

6 – 10 Year Plan

- In the second and third phases of development, the proposed Deemed-to-be University will significantly expand its infrastructure to accommodate additional student capacity.
- The second phase will focus on building facilities to support 3,600 students. It will focus on adding additional –
    - state-of-the-art technology-enabled classrooms
    - workshops
    - high-tech laboratories
    - computer labs
    - sports facilities
    - It will also increase the capacity of the following to accommodate 3,600 students:
    - residential facilities
    - other essential amenities to support a comprehensive educational environment.
- Upgrade and expand the elements of sustainability in the infrastructure

11 – 15 Year Plan

• The third phase will further increase capacity for an additional 4,200 students.
• This will include the construction of new:
    • academic buildings
    • residential facilities
    • recreational areas
• Upgrade and maintain the elements of sustainability in the infrastructure

Table 13 : 15-Year Plan for Infrastructure Development

In conclusion, the infrastructure development plan is a critical component of the proposed Deemed-to-be University's strategic vision, ensuring the creation of world-class facilities that meet both current and future needs. The phased approach, encompassing the transitory and main campuses, reflects a commitment to sustainable and innovative development. By implementing this plan, the proposed Deemed-to-be University aims to provide an optimal environment for education, applied research, and community engagement, thereby supporting its mission of excellence and innovation.

7.6 Plan for Faculty and Other Staff Recruitment

This section outlines the proposed Deemed-to-be University's comprehensive recruitment plan, emphasizing the commitment to attracting and retaining professionals who are not only experts in their fields but also passionate about advancing knowledge and fostering student growth. The hiring strategy is designed to bring together a dynamic mix of experienced academics, research-oriented faculty, and industry practitioners. This will ensure that the proposed Deemed-to-be University offers students a balanced perspective, combining academic rigor with real-world insights and innovative approaches to problem-solving.

Attracting and retaining top-tier faculty is a defining factor for the success of an academic institution. It fosters diverse perspectives, propels research efforts, and elevates the educational experience for students. To achieve this, a well-designed faculty recruitment plan comprising various cadres of academic staff is essential.

The proposed Deemed-to-be University would consist of different cadres of faculties: Professors, Associate professors, and Assistant Professors for teaching. Instructors and Mentors will be involved in imparting experiential and practical learning to students enrolled in the digital programs offered by the proposed Deemed-to-be University. Visiting and international faculty will consist of faculty focused on industry and academia which will provide quality teaching in areas of their expertise to provide more exposure to students to the market and industry trends. Additionally, the proposed Deemed-to-be University will have Adjunct Faculty for teaching specialized courses and Professors of Practice for alignment of the program with industry demands.

At present, NAMTECH has managed to bring together a distinguished group of accomplished scholars from diverse industries and leading academic institutions worldwide. This strategic mix plays a pivotal role in delivering a holistic educational experience, equipping students with the skills and knowledge to meet the multifaceted demands of their industries while enhancing their technical proficiency.

The expertise of the core faculty is further enriched by visiting guest faculty from prestigious organizations such as Festo, TUM Asia, and Purdue Northwest. The table below mentions the current strength of NAMTECH faculty-

Academic Faculty	
Program Directors	2
Professors	1
Associate Professors	1
Assistant Professors	15
Adjunct faculty	8

Industry Faculty	
Professors of Practice	-
Adjunct Faculty	9

This alignment underscores NAMTECH's unwavering commitment to excellence in every aspect of its academic pursuits.

This plan will outline the key components of the faculty recruitment plan to attract a diverse pool of qualified candidates and make the proposed Deemed-to-be University a desirable destination for talented faculty.

7.6.1 Teaching Staff

Each academic program will be taught by faculty both permanent as well as visiting. The proposed Deemed-to-be University envisages to operate with faculty with the titles of Professor, Associate Professor, and Assistant Professor, a 1:2:6 cadre mix will be maintained. The proposed Deemed-to-be University will hire faculty from prominent institutions, universities, and industries. All the faculty will have a minimum level of education in accordance with UGC regulations, with preferred work experience.

The proposed Deemed-to-be University will achieve a **faculty-student ratio of 1:14** in the first 5 years of its operations and maintain it thereafter. This faculty-student ratio will be maintained thereon forward.

The faculty recruitment policies detailed further will be adopted by the proposed university, to meet the academic plan as proposed earlier. The focus will be on recruiting faculty with experience and skill sets aligned with the focus areas as identified in the earlier sections over time. The Selection Committee will be responsible for making recommendations to the Executive Council for appointment to the post of Professors, Associate Professors, Assistant Professors, and such other posts as may be prescribed, in accordance with the UGC (Minimum Qualifications for Appointment of Teachers and other Academic Staff in Universities and Colleges and other Measures for the Maintenance of Standards in Higher Education) Regulations, 2018.

Details	Yr-1	Yr-2	Yr-3	Yr-4	Yr-5	Yr-10	Yr-15
Total Students	240	420	420	1320	1920	5520	9000
Faculty	34	44	44	105	138	394	630
FSR	7	10	10	13	14	14	14
Professor	6	8	8	18	23	66	105
Associate Professor	12	15	15	35	46	132	210
Assistant Professor	16	21	21	52	69	196	315

Table 14 : 15 Year Plan for Teaching Staff

The table above reflects the increment of the **permanent teaching staff** over the 15 years. With the increase in the capacity of students enrolled, there is also an increase in the teaching staff year-on-year. The proposed Deemed-to-be University will strive to have quality faculty and maintain the faculty-student ratio in steady state. In addition to the permanent faculty, the proposed Deemed-to-be University will consist of faculty working part-time. The diverse types of which are described as below:

Visiting / Guest faculty

As discussed above, the proposed Deemed-to-be University will also consist of visiting faculty which will focus on imparting knowledge aligned to their areas of expertise in academia and industry. The proposed Deemed-to-be University will collaborate with global MNCs, large Indian firms, top academic institutes in India and abroad for curriculum design and teaching. The visiting / guest faculty will include Adjunct Faculty and Professors of Practice which are detailed below.

- **Adjunct Faculty**

  The proposed Deemed-to-be University will employ Adjunct Faculty who will consistently teach multiple courses throughout the academic year. They will also be actively engaged in their professional and academic practices, placing them in a prime position to offer up-to-date industry knowledge to the classroom. The Roles and responsibilities, costs, and honoraria for empanelled adjunct faculty will be abided as per UGC regulations.

- **Professors of Practice**

  The National Education Policy 2020 urges HEIs to improve industry-academia collaboration and integrate vocational education with general education. And to support this, they have launched a new category of roles designated "Professor of Practice" that will allow industry and other professional knowledge to enter academic institutions. This will strengthen the faculty capacity in HEI and facilitate in bringing real-world methods and experiences into the classroom. In turn, trained graduates with the necessary skill set and will help the industry and society. The proposed Deemed-to-be- University will leverage the UGC’s Professor of Practice portal to register themselves and onboard the experts. The number of Professors of Practice in the proposed Deemed-to-be-University shall not exceed 10% of the sanctioned posts. The Roles and responsibilities, tenure, and honoraria for empanelled professors of practice will be abided as per UGC regulations.

Faculty Diversity and Mix: The proposed Deemed-to-be University will be actively seeking out top faculty members from around the world. The faculty includes academics, researchers, practitioners, and educators with expertise in -

- **Academic**: Teaching in top 100 national universities like IIM, IITs, NIT or top 100/200 Foreign Universities as per QS ranking.

- **Research**: Supported by organizations like ICAR, ICSSR, CSIR, ICMR, DRDO, Central and State Universities, etc.
- **Industry**: Industry experts based on location advantage (“campus within corporate”)
- **Government**: Professionals from Central and state public sector undertakings (PSUs), business corporations, UGC, National Skills Development Corporation or Sector Skill Councils in their respective area for skills education and training etc.
- **International**: NRIs working with overseas academic, research and business organizations or having a demonstrated interest in Indian issues

Innovative academic programs will be designed and taught at the proposed Deemed-to-be University by top representatives of business, academia, and professional practitioners. The institution will also feature industry alumni who may help students pursue their interests. To maintain diversity as a key value, the proposed Deemed-to-be University will devote special focus to hiring qualified faculty from different domains and we will concentrate on three areas for faculty mobilization:

Academics: The proposed Deemed-to-be University shall aim to nurture and build an academic talent pool by identifying students at early postgraduate levels who demonstrate academic excellence. They would be provided opportunities as tutors and mentors to develop their skills in the area. The institution shall also aid the continuous professional development of existing staff through support to develop teaching expertise, international exposure and provide training & development opportunities.

Industry Experience: The proposed Deemed-to-be University campus will cater to various sectors under manufacturing domain, which will create infinite possibilities to revolutionize collaboration and innovation between industry and academia. The proposed Deemed-to-be University shall have a mix of faculty who teach multiple courses over the academic year as well as are faculty pursuing their professional practice and well-positioned to bring current industry expertise into the classroom.

International Exposure: The proposed Deemed-to-be University shall forge and strengthen international partner relationships. These partnerships shall provide long-term, high-impact, collaborative learning, and staff mobility opportunities.

The proposed Deemed-to-be University shall look at a broad segment of faculty base to recruit the best overseas talent:

- **Overseas Citizen of India**: Foreign nationals of Indian origin who might be interested in working in an innovative institution in India (Visa relaxation)
- **Person of Indian Origin**: Faculty members / researcher who are spouses of Indian nationals can be considered (Visa relaxation)

- **NRIs with a terminal degree from university in foreign country** to leverage domestic academic network to identify and **NRIs with Teaching/ Research experience university in foreign country** to leverage domestic academic network to identify.
- **Foreign nationals**: Leverage collaborations to identify PhD students/ faculty members.

1 – 5 Year Plan

- Develop a recruitment process that captures key performance indicators such as publications, patents, revenue generation, extramural funding, product development, and community service, to ensure the proposed Deemed-to-be University is attracting top-quality faculty.
- Institutionalize a fast-track recruitment process with clear criteria and an efficient application and interview process.
- Focus on hiring candidates from diverse backgrounds, including industry, government, non-profit organizations, and academia, to ensure a breadth of perspectives and experiences.
- Proactively encourage faculty with international academic experience and research credentials to apply.
- Develop a vibrant ecosystem of housing, facilities, and environment for faculty to enhance the proposed Deemed-to-be University's appeal to potential hires.
- Establish policies around joining grants and other financial incentives to attract top-quality faculty in a competitive job market.
- Organize regular training sessions for faculty on innovative teaching methodologies in collaboration with partners.
- Encourage participation in national and international conferences.
- Establish peer review mechanisms to promote collaborative teaching improvements.
- Appoint the faculty as mentor for a group of 4-5 students to guide them during their 2-year program

6 – 10 Year Plan

- Maintain a mix of faculty from diverse backgrounds, including industry, government, non-profit organizations, and academia, to ensure the proposed Deemed-to-be University is creating a dynamic and inclusive learning environment.
- Accelerate the composition of visiting faculty to teach specialized subjects by leveraging the proposed Deemed-to-be University’s collaborations with academia and industry.

- Provide support to help existing faculty develop their teaching and research skills through international exposure and other training opportunities.
- Encourage faculty to remain engaged in industry and innovation beyond the classroom to enhance their relevance and expertise.
- Develop new and diversified training programs to attract top-quality faculty to the proposed Deemed-to-be University.

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- Increase the proposed Deemed-to-be University's outreach efforts to attract candidates from underrepresented groups.
- Recognize and support distinguished faculty through professorships, awards, and other incentives.
- Facilitate staff exchanges and other professional development opportunities to support the growth and development of existing faculty.
- Maintain a cutting-edge ecosystem of housing, facilities, and environment for faculty to ensure the proposed Deemed-to-be University remains competitive in attracting and retaining top-quality hires.
- Innovate academic programs and incentives to attract top-quality faculty to the proposed Deemed-to-be University and ensure continued success in the future.

Table 15 : 15 Year Plan for Teaching Staff

Recruitment Policy

The proposed Deemed-to-be University will focus on maintaining high standards of academic and research excellence. To achieve the same, it aims to work on the following key parameters while recruiting the faculty. The processes would be fair, equitable, respectful, transparent, consistent, and confidential.

- All processes would be aligned with the goals, objectives and values stated above.
- Encourage applications from the widest pool of candidates meeting the defined selection criteria.
- All processes are compliant with statutory / legislative requirements and obligations.
- Processes and practices are competitive, merit-based, and due diligence will be exercised.

In addition to the above process, the recommendation given by Selection Committee to the Executive Council for appointment to the post of Professors, Associate Professors, Assistant Professors will be taken into consideration while recruitment.

Faculty Development Initiatives

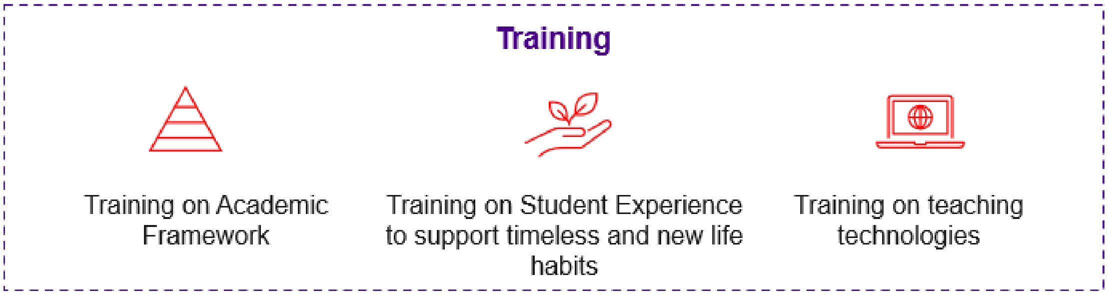

Figure 34 : Approach for faculty development

- Promote development of skills strongly linked to organizational success: leadership and management development; academic & technical development; and cultural change.
- Creation of a formal mentorship process to nurture and build capacity in junior faculty to advance in their academic careers.
- Undertake Faculty development initiatives:
  - **Access to global network:** Facilitate collaboration with leading academicians in the world.
  - **Research incentives:** Dedicated research seed fund for initiating research
  - **Faculty exchange programs:** Facilitate faculty to work in global universities as part of international mobility initiatives.
  - **On-the-job trainings:** Workshops, technical training, soft skill trainings will be recognized for the benefit of faculty members.

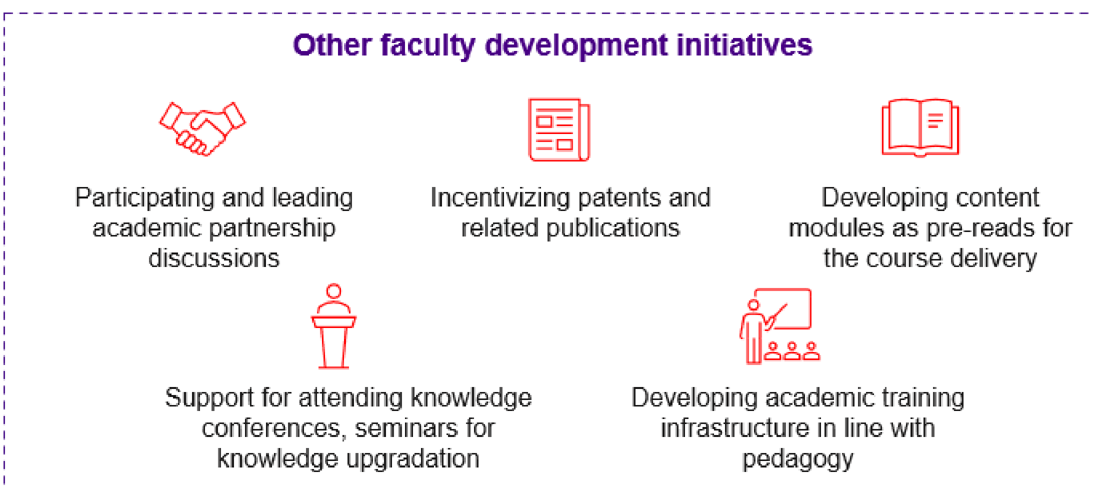

Figure 35 : Other initiatives for faculty development

- The proposed Deemed-to-be University will support growth within the domain of expertise whether teaching or research as well as allow fluidity of movement between pathways.
- Faculty will be given an option to pursue sabbaticals, industry secondments, projects, and temporary assignments to engage in academic or professional growth.

7.6.2 Non-Teaching Staff

Non-academic staff constitutes of the administrative and executive staff which form the backbone for smooth operations of any educational institution. They ensure the academic staff receives the support required to impart excellent education and provide an exceptional campus experience of highest standards to students. The below table indicates the various executive staff members of the proposed Deemed-to-be University.

S. No	Designation	Number
1	Chancellor	1
2	Vice Chancellor	1
3	Registrar	1
4	Chief Accounts & Finance Officer	1
5	Controller of Examinations	1
6	Dean of Academics	1
7	Program Directors	4
8	Director of Human Resources	1
9	Director of Research	1
10	Director of Technology	1
11	Director of Projects and Planning	1
12	Director of Corporate partnerships	1
	Total Members	**15**

Table 16 : Proposed management and administrative positions

The table below reflects the increment of the administrative staff over the 15-year period.

Details	Yr-1	Yr-2	Yr-3	Yr-4	Yr-5	Yr-10	Yr-15
Management	15	15	15	15	15	15	15
Senior Manager	16	16	16	18	20	49	77

Manager	31	32	32	36	39	97	154
Associate	89	95	95	104	114	288	462

Table 17 : 15 Year plan for Nonacademic staff

Compensation and benefits for non-academic staff is just as important as that of academic staff. Some of the welfare policies for non-academic staff are enumerated below:

- Non-Monetary Incentives including better infrastructure facilities, leave policy for maternity for female employees and employees with special needs.
- Monetary incentives including provident fund, increment as per government policies, loan facility, group insurance and subsidized medical treatment.
- Learning and development opportunities for upskilling and developing managerial skills, development for efficient use of IT infrastructure and workshops for developing leadership qualities and prepare them for taking leadership roles.
- Transport allowance, annual conference travel with academic staff, learning and development allowance, incentives for training, summer, and winter leave policies etc.

Through a rigorous and forward-thinking recruitment plan, the proposed Deemed-to-be University aims to build a foundation of talented educators and dedicated staff who embody the vision and values. The commitment to excellence in hiring ensures that the proposed Deemed-to-be University will not only produce industry-ready graduates but also contribute meaningfully to India's strategic objectives in emerging sectors. By prioritizing continuous professional development and a supportive work environment, the aim is to foster a vibrant academic community capable of evolving alongside industry and technological advancements.

7.7 Plan for Institutional Positioning & Communication

This section details the approach to building a positioning in higher education landscape that reflects our mission of academic excellence, innovation, and industry relevance. The proposed Deemed-to-be University's strategy will leverage both traditional and digital platforms to communicate the values and highlight the unique offerings, from specialized programs to global partnerships. Through targeted outreach and consistent messaging, the aim is to attract students, faculty, and partners who resonate with the vision and are invested in the transformative journey.

Role

The Institutional positioning will help the proposed Deemed -to-be University to communicate a differentiated positioning to internal and external stakeholders and help promoting international recognition of the brand. Additionally, this will also help in building the brand and improving the academic and industry association profile. This will be crucial in:

- Attracting potential students and enhanced alumni engagement
- Attracting faculty
- Increasing academic and employer reputation
- Engaging with leading global universities for collaborations
- Engaging with leading industry players for collaborations

Key Initiatives

To achieve goals that the proposed Deemed-to-be University aims, a comprehensive branding strategy to enhance institute's image and outreach over a span of 15 years has been strategized.

Figure 36 : Branding Framework

This comprehensive strategy aims to systematically build, strengthen, and elevate the institution's brand over 15 years, ensuring it becomes a recognized leader in higher education.

7.7.1 15 Year Strategic Plan for Institutional Positioning & Communication

1 – 5 Year Plan: Establishing foundation	
Brand Identity	• **Brand Strategy:** Develop a strategic brand framework that defines the institute's unique value proposition and key messaging. • **Visual Identity:** Create a cohesive visual identity, including logo, color palette, and typography, to ensure consistent branding across all platforms.
Visibility and Recognition	• **Marketing Campaigns:** Launch targeted marketing campaigns to highlight the institute's strengths and achievements. • **Academic Rankings:** Increase participation in national and international academic rankings and associations to enhance visibility
Community Engagement	• **School of Social Impact:** Develop a community outreach school to address local needs through research and volunteer programs, reinforcing the institute's commitment to societal impact. • **Local Engagement:** Organize regular community events, seminars, and workshops to engage with local stakeholders. • **Alumni Network:** Establish an alumni association and develop robust alumni engagement programs to foster long-term relationships.
Digital Presence	• **Website Redesign:** Redesign the university website to be user-friendly, mobile-responsive, and visually appealing, reflecting the brand's identity. • **Social Media Strategy:** Enhance social media presence with strategic content that aligns with the institute's brand values and messaging

6 – 10 Year Plan: Strengthening the positioning	
Brand Identity	• **Brand Refinement:** Continuously refine the brand strategy based on feedback and evolving market trends. • **Visual Consistency:** Ensure all branding materials remain consistent and up to date with the institute's visual identity.
Visibility and Recognition	• **Targeted Campaigns:** Launch marketing campaigns in key regions to broaden visibility. • **Global Rankings:** Aim for higher positions in global academic rankings.

Community Engagement	• **Expanded Outreach:** Increase the frequency and scope of community events and initiatives. • **Partnership Programs:** Develop programs that involve local businesses and organizations in institute activities.
Digital Presence	• **Content Strategy:** Develop a comprehensive content strategy for digital platforms to engage diverse audiences. • **Analytics:** Use data analytics to measure the effectiveness of digital campaigns and adjust strategies accordingly.

11 – 15 Year Plan: Elevating the positioning	
Brand Identity	• **Global Leadership:** Position the institute as a leader in advanced manufacturing technologies and industry 4.0 areas. • **Brand Ambassadors:** Establish a brand ambassador program involving faculty, students, and alumni to promote the institute's values and achievements.
Visibility and Recognition	• **International Campaigns:** Launch international student recruitment campaigns to expand the university's global reach. • **High-Profile Events:** Participate in high-profile national and international events and conferences to enhance the institute's reputation.
Community Engagement	• **Global Initiatives:** Expand community engagement initiatives to international communities.
Digital Presence	• **Innovative Technologies:** Leverage emerging technologies for virtual engagement and learning. • **Global Reach:** Enhance the institute's digital presence to reach a global audience, ensuring the brand remains relevant and forward-thinking.

Table 18 : 15 Year Plan for Institutional Positioning and Communications

In conclusion, the positioning and communication efforts will be central to creating a lasting impact, both within India and internationally. By conveying a clear and compelling narrative about the proposed Deemed-to-be University's purpose, values, and achievements, we will cultivate a positive reputation that strengthens the position in the higher education landscape. This proactive and authentic approach to communication will not only attract top talent and partnerships but also foster trust and engagement with the community, paving the way for sustainable growth and influence in the years to come.

7.8 Plan for Student Admissions

This section outlines the strategy for reaching prospective students across India and globally, with a focus on promoting unique programs, an industry-oriented curriculum, and a supportive campus environment. By employing a mix of outreach initiatives, partnerships with global partners, and a streamlined admissions process, the aim is to build a strong and inclusive student body that will thrive in the proposed Deemed-to-be University's dynamic learning environment.

The admissions process is a critical element in shaping the student body and determining the university's long-term success. A well-designed admissions plan attracts a diverse pool of qualified applicants and ensures alignment with the institution's mission, academic goals, and values. Below is a comprehensive admissions plan that outlines the key elements for effectively managing student intake.

Admission of students to the proposed Deemed-to-be University shall be strictly based on admissions criteria defined by the program directors of the schools, admissions committee, and merit in the entrance examination. The admission process and requirements will be specified in the prospectus as well as on the official website.

7.8.1 Admission Objectives

The primary objectives of the proposed Deemed-to-be University's admissions plan include the following:

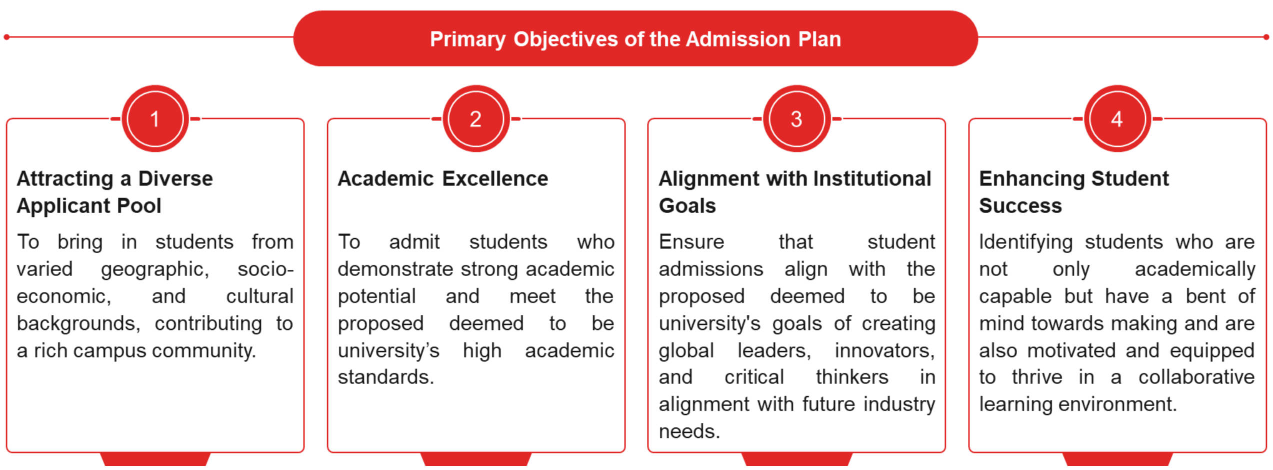

Figure 37 : Objectives of the Admission Plan

7.8.2 Admission Process and Criteria

To attract students in line with the proposed operational model of the proposed Deemed-to-be University, the admission process with be designed around the guiding principles of merit, fairness, diversity, inclusivity, and holistic evaluation.

- **Merit Based:** The admissions process will involve evaluation of students based on academic achievement and willingness to learn.
- **Fairness:** Commits to ensuring fairness in the admission and selection process by giving fair opportunity to all applicants
- **Inclusivity:** Acknowledges the socio-economic factors that have deprived talented candidates of access to education and aims to play an important role in providing candidates opportunities to learn by offering scholarships
- **Diversity:** Aims to attract a diverse pool of talented candidates from across the state and other regions of the nation, across socio-economic profiles and genders, and interest areas and choice of careers to create an environment for enhanced peer learning
- **Holistic Evaluation:** The admission process will be holistic focusing on various aspects such as merit, program-specific aptitude, skill matching, and counseling to match students with its program's economically and socially challenged students.
- **Affirmative action:** The proposed Deemed-to-be University will be taking affirmative action as per the prevailing government rules to help economically and socially backward students.

The admissions process will include a well-structured and transparent approach with defined stages:

- **Online Application Portal**: A user-friendly online platform allowing applicants to submit all required documents, track their application status, and communicate with the admissions team.
- **Eligibility Criteria**: Clear and consistent eligibility criteria will be defined for each program, including academic qualifications, standardized test scores, language proficiency, and personal attributes.

Area	Criteria
Graduation Year	• Candidates who are in their final year (graduating in the year the program starts) or have successfully completed their B.E. / B.Tech. exams within the last five years of the program start.
Graduation Program	• Full-time B.E. / B.Tech. from AICTE/ UGC approved university • B.E. / B.Tech. in relevant fields
Academic Record	• Minimum 65% / 7 CGPA or equivalent grade in 10th, 12th, and B.E. / B. Tech • No active backlogs during the admission process

Area	Criteria
Entrance Exam	• GATE or • GRE or • Proposed Deemed-to-be University's admission test

Table 19 : Eligibility Criteria

Selection Process: The proposed Deemed-to-be University will follow a multi-step evaluation and selection process for admission. The below process will be followed by the proposed Deemed-to-be University for the admissions.

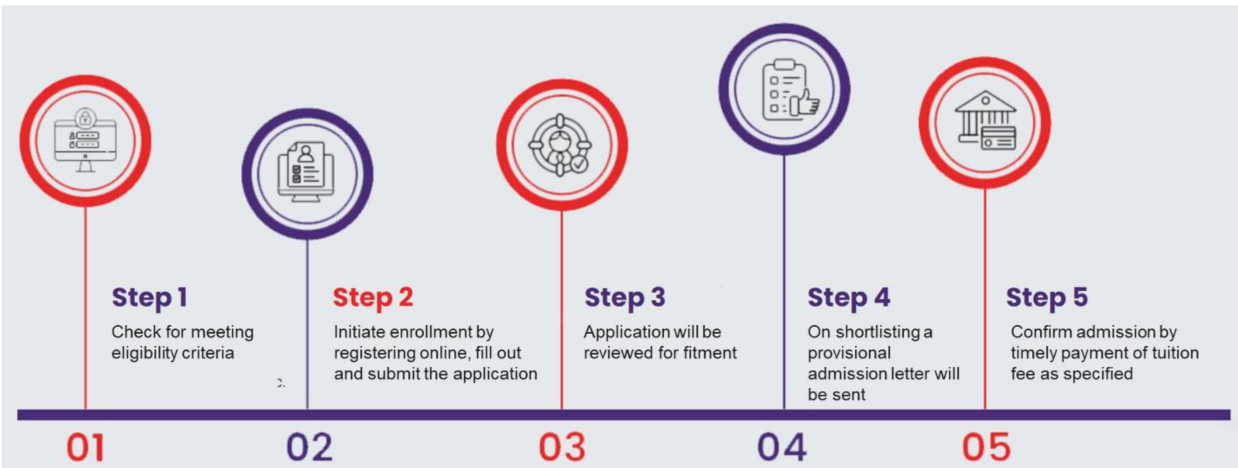

Figure 38 : Admission Process

7.8.3 Financial Aid

To encourage diverse enrollment and make quality education affordable for all learner segments, the proposed Deemed-to-be University will provide scholarships for meritorious students and students from financially deprived backgrounds to achieve their educational goals. The number of awardees will increase in proportion to the increase in the number of students enrolled at the proposed Deemed-to-be University in the particular year. At a steady state by year 7 onwards, 10% of fee revenue will be set aside as financial aid for students.

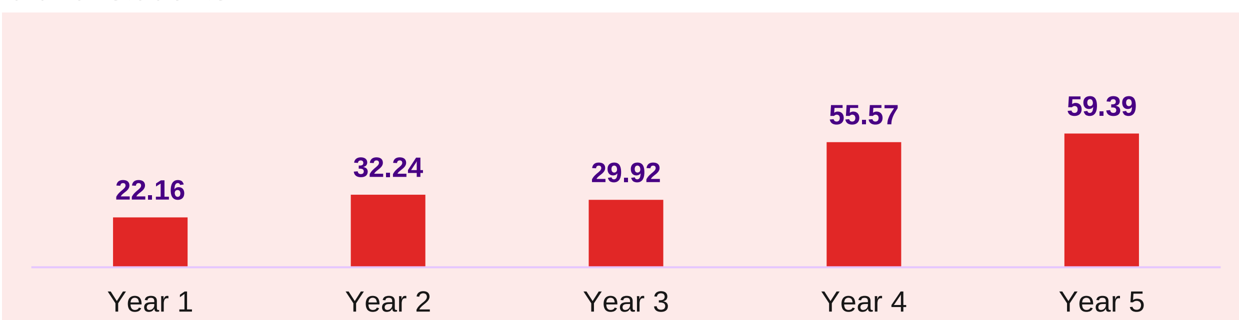

Figure 39 : 15 Year plan for student scholarships in INR Cr

The proposed Deemed-to-be University will offer the following scholarships:

- **Merit-based Scholarships:** These scholarships will be offered to students based on their merit. The percentage of the scholarship will vary for each merit slab. The proposed Deemed-to-be University will also aim at reducing the number of scholarships awarded as it reaches its steady state. Below are the types of merit scholarships that will be introduced in the proposed Deemed-to-be University.
  - Scholarship for meritorious students based on admission test.
  - Scholarship for students from Institutes of National Importance
  - Scholarship for students from Institutes of Eminence
  - Scholarship for students from NIRF's top 100 ranked institutes
- **Merit-cum-Means Scholarship:** Provide financial assistance to poor and meritorious students belonging to families with an annual income less than the said amount. The yearly income limit for receiving the scholarship will be revised every year to accommodate the changes in fee structure and economy.
- **Women in Manufacturing:** Providing financial assistance to help power the movement of women by enabling them to pursue higher education in core domains.

7.8.4 Enrollment Management

Once students are admitted a smooth transition into university life is critical for students. The proposed Deemed-to-be University will follow a student-friendly enrollment management process.

- **Yield Management:** Track accepted students and their enrollment status to optimize class sizes.
- **Waitlists:** Maintain waitlists for programs with high demand.
- **Orientation Programs:** Conduct comprehensive orientation programs to welcome new students covering academic expectations, campus facilities, extracurricular opportunities, and career guidance.
- **Pre-Arrival Information**: International students will receive visa guidance, housing information, and cultural orientation to ease their transition.
- **Student Success Programs**: Mentorship, counseling, and academic support programs will be available to assist students throughout their educational journey.

7.8.5 Student Diversity & Inclusion

The proposed Deemed-to-be University will focus on admitting a diverse range of students. A balanced gender mix and representation from international students will bring diversity and enhance peer-based learning. The proposed Deemed-to-be University will provide a favorable ecosystem for students from all walks of life. A few interventions to promote student diversity include:

- **Inclusive Recruitment:** Implement strategies to attract students from diverse backgrounds.
- **Diversity Promotion and support:**
  - Providing merit-based scholarships during admission to females and economically weaker sections
  - Conducing sensitization training for gender and social inclusions on the campus
  - Career development programs in soft skill development and training
  - Institution of committees including PoSH, Safety and Crime Prevention, Student Wellness, and Diversity and Inclusion to enable a safe environment for all.
- **Inclusive Campus Culture:** Foster a welcoming and inclusive environment for all students.

7.8.6 15-Year Student Admission Plan

The figure below highlights the enrollment plan for student admission for master's during the first 15 years of operations.

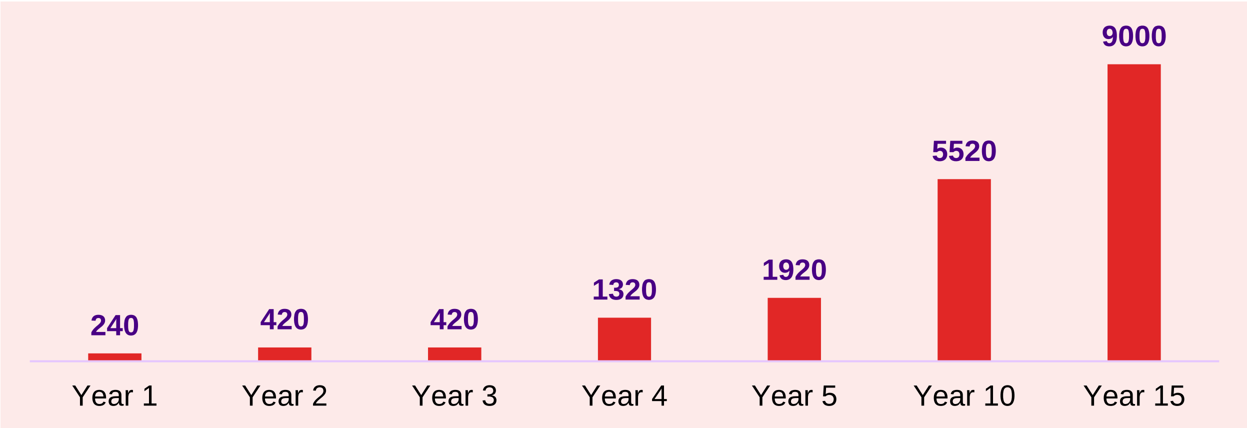

Figure 40 : 15 Year plan for Student Enrollment in Masters program

In conclusion, this admissions plan outlines a structured, transparent, and inclusive approach that aligns with the proposed Deemed-to-be University's mission to attract a diverse and talented student body. By leveraging technology, targeted outreach, and a holistic selection process, the proposed Deemed-to-be University will ensure the admission of students who will thrive academically and contribute positively to the campus community.

7.9 Plan for Administration

This section provides an overview of the strategic plan for administration, focusing on key areas essential to student success and institutional growth. The approach integrates various elements to form a cohesive framework designed to uphold academic and operational standards and promote collaborative governance within the proposed Deemed-to-be University.

7.9.1 Quality Assurance System

The proposed Deemed-to-be University to provide for high-quality teaching and research of global repute will set up a comprehensive Quality Assurance System (QAS). This system will serve as the foundation for maintaining excellence, driving continuous improvement, and positioning the proposed Deemed-to-be University competitively at both national and international levels.

The implementation and monitoring of the quality of processes, practices and outcomes will be spearheaded by the establishment of an Internal Quality Assurance Cell (IQAC). The IQAC will focus on refining curriculum delivery, promoting innovation in pedagogy, enhancing research practices, and ensuring that faculty and student feedback mechanisms are effectively integrated into decision-making processes. Regular audits, self-assessments, and feedback loops will be implemented to foster a culture of continuous improvement and sustained excellence within the institution.

Role of IQAC:

- Development and deployment of quality benchmarks
- Source feedback and analyze the feedback from various stakeholders.
- Strive towards enabling a student-centric environment through the promotion of best practices.
- Foster a culture of quality education and research through capacity building.
- Maintaining MIS for tracking of Institute’s performance
- Preparation for accreditations and rankings
- Applying for various accreditations and Rankings
- Conducting regular quality audits
- Active contribution to all the processes like recruitment, appraisal, teaching-learning, assessment, strategic planning & implementation, etc. of university administration

The QAS will focus on meeting rigorous standards set by national and international ranking bodies and accreditation agencies. This will involve aligning institutional practices with global benchmarks, ensuring compliance with evolving criteria for rankings, and pursuing prestigious accreditations that demonstrate the proposed Deemed-to-be University's commitment to world-class education. The proposed Deemed-to-be University will actively engage with external evaluators and accreditation bodies to not only meet but exceed quality expectations, thereby establishing itself as a leader in the academic landscape.

Learning is the central activity of any higher education institution. Integrating data-driven insights into the proposed Deemed-to-be University's quality assurance system will enhance the learning quality by continuously refining instructional design. The quality of learning can be ensured by collecting necessary data backed by learning science, analyzing it, and incorporating the insights from the analysis into instructional design iteratively.

Learning Engineering for Improving Learning Outcomes Using Technology

Demand and Need: There is a growing demand for holistic learning engineering that bridges the gap between theoretical knowledge, research, practical, data-driven application, and adaptive instructional design. With India producing nearly 1.5 million engineers annually yet seeing high levels of skill gaps in employability there is a need to reshape their interaction with learning.[32]

Learning engineering is a process and practice that applies the learning sciences using instructional design methodologies and data-informed decision-making to support learners and their development.

- **Learning sciences** enable building a framework to measure the learning outcomes scientifically.
- **Instructional design** for creating engaging content based on learning science and feedback from data analysis.
- **Data informed decision-making** enabled by data collection based on learning outcome measurement, learner engagement, and learning quality for adapting to learner's behavior.

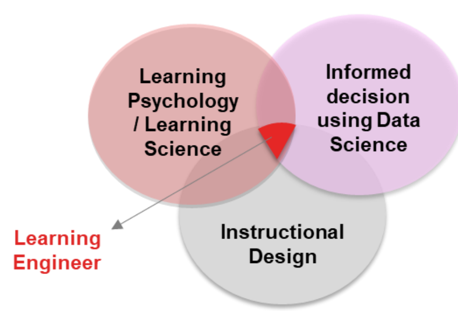

Figure 41 : Concept for Learning Engineering

The proposed Deemed-to-be University will bring in expertise and best practices followed across the leading global institutes with an objective of shaping the future of education in India, empower learners, and build the credibility as a leader in social impact and a pivotal

[32] National Engineering Day: 90% of graduates face employability challenges - India Today

player in shaping the future of education globally. The key practices that the proposed Deemed-to-be University will work on are as follows:

1. **Promote Evidence-Based Learning Practices:** Evidence-based practices are fundamental to ensuring that learning is both effective and grounded in research. The proposed Deemed-to-be University will drive the adoption of such practices by focusing on:
    - **Research on Learning Processes:** Conducting in-depth studies to understand how students learn, which will enable the development of teaching strategies that are proven to enhance learning outcomes.
    - **Data-Driven Decision Making:** Leveraging data analytics to make informed decisions that can continuously improve educational methodologies and resource allocation, ensuring that the institution remains responsive to students' needs.
2. **Design and Development of Learning Technologies:** In an era defined by rapid technological advancements, the creation of innovative learning tools is critical. The center will prioritize:
    - **Innovative Learning Tools:** Developing cutting-edge digital tools and platforms that facilitate interactive and engaging learning experiences, which can be integrated into both online and hybrid learning models.
    - **User-Centered Design:** Focusing on the needs of learners by incorporating feedback and usability studies into the design process, ensuring that tools are accessible, intuitive, and tailored to diverse learning styles.
3. **Research and Evaluation:** The proposed Deemed-to-be University will work towards incorporating learning innovation, conducting rigorous empirical research, and evaluating outcomes are essential to validate the effectiveness of various educational practices and tools. This objective involves:
    - **Conducting Empirical Studies:** Performing systematic research to evaluate new teaching strategies, tools, and programs, establishing a scientific basis for their effectiveness and scalability.
    - **Assessment of Learning Outcomes:** Implementing robust assessment methodologies to measure and improve student performance, enabling continuous improvement in instructional methods and curriculum design.
4. **Fostering a Culture of Innovation:** To remain at the forefront of educational transformation the proposed Deemed-to-be University will create an environment that encourages experimentation and supports the development of pioneering projects. This will include:

- **Platform for Encouraging Experimentation:** Establishing a supportive infrastructure where faculty and students can test new ideas, prototype technologies, and pilot new instructional approaches without the risk of failure impeding progress.
- **Supporting Innovative Projects:** Providing resources and mentorship for innovative initiatives, thus nurturing a pipeline of new ideas that can address contemporary challenges in education.

5. **Interdisciplinary Collaboration:** Education today is increasingly interconnected with various disciplines, and effective learning strategies often require insights from multiple fields. The idea is to promote interdisciplinary collaboration by:
   - **Engagement Across Disciplines:** Encouraging partnerships and cross-disciplinary projects among different academic domains to create a holistic and enriched educational experience.
   - **Partnerships with Faculty:** Building strong collaborations with faculty members across disciplines to integrate diverse perspectives and expertise, thereby fostering an inclusive and comprehensive approach to learning innovation.
6. **Professional Development and Training:** Ensuring that faculty and staff are well-equipped to adapt to emerging educational trends is crucial for institutional success. The proposed Deemed-to-be University will provide:
   - **Faculty Development Programs:** Offering training programs to enhance teaching competencies, especially in areas like digital pedagogy, data-driven instruction, and the use of educational technologies.
   - **Workshops and Seminars:** Hosting regular events to keep faculty updated on the latest educational research and instructional methods, fostering a culture of continuous professional growth.
7. **Scalable Solutions for Education:** Finally, to maximize the center's impact, scalable educational models will be developed to make high-quality education accessible to a broader audience. Key efforts include:
   - **Creating Scalable Educational Models:** Developing modular and flexible course structures that can be easily scaled to accommodate large numbers of students while maintaining instructional quality.
   - **Focus on Accessibility:** Prioritizing accessible design to ensure that all students, regardless of physical location or personal circumstances, have equal opportunities to benefit from the institution's offerings.

Impact: By aligning with these key objectives, the proposed Deemed-to-be University is set to drive significant advancements in educational practice, support interdisciplinary collaboration, and empower both learners and educators. This initiative not only strengthens our institution's role as a catalyst for innovation but also reinforces our commitment to fostering an inclusive, evidence-based, and technologically enhanced learning environment.

Feedback system

The proposed Deemed-to-be University plans to set up an elaborate feedback system which will enable obtaining and analyzing feedback from various stakeholders. This is elaborated in the following passages.

Students are the most vital component of the education system and therefore their feedback shall be regarded as core to the quality assurance, sustenance, and enhancement. The proposed Deemed-to-be University shall conduct **Student Feedback Survey**, from the existing students during various stages of their academic progression to understand their experiences in the institute.

The proposed Deemed-to-be University shall also seek **feedback annually from its alumni**. Alumni are the most likely people to endorse, support and invest in their alma mater through their continuous and active engagement. Thus, it is important to understand their experience at the proposed Deemed-to-be University and seek suggestions for further enhancement of proposed Deemed-to-be University program and facilities.

Additionally, **annual feedback from faculty** will be gathered to assess their teaching experience and facilities at the proposed Deemed-to-be University. The feedback from the students and faculty will help the institute to assess its services for the students and teachers, and areas that need to be improved to enhance the quality of the proposed Deemed-to-be University.

Furthermore, the proposed Deemed-to-be University will make sure that the learning delivered here aligns with and caters to the industry requirements by getting **feedback from the employers**. Every year, incumbent students will apply for internships while passing out graduates will seek to work with Industry. In all such instances, employers will be requested to give feedback on their employees (who are alumni/incumbent students). The Employers will also be requested to discuss their perceptions based on their employees' performance.

Finally, parents play a crucial role in the development and improvement of the caliber of educational experience **Parents' feedback** enables the proposed Deemed-to-be University to assess the quality of its services and tailor its offerings to the needs of its students. The need for parental involvement in ensuring high-quality education will be reinforced during the feedback analysis process. Parents will be actively involved in the student's holistic development.

Stakeholder	Feedback Area
Student	The feedback shall be collected on a bi-annually basis and captured using an app/portal developed for this purpose. To ensure that feedback is gathered from all students, the students shall be required to fill the survey to be eligible to view their Grade sheet. Students shall give their feedback on the teacher(s) who taught them for a given course (subject). The name of the course, name of faculty members and subject taught shall be displayed on the app. • Reason for choosing the course/institution. • Match between curriculum and expectations (flexibility, choice, content) • Appropriateness of the curricular content to the development of knowledge and skills • Relevance to prospective career/further study • Student timetable and workload • Opportunities for practical, hands-on experience • Range of teaching and learning methods experienced. • Students' views on quality of teaching • Guidance and support for independent study • Students' understanding of assessment methods and criteria. • Feedback on assessed work. • Computer center, library, labs, and other academic facilities • Extra-curricular facilities • Health services and Sports & Physical Education • Canteen facilities • Grievance redressal mechanism • Financial aid, Academic and Personal Counseling • Mental Health and Well Being
Alumni	• Academic Infrastructure and facilities at the institute • Relevance of the curriculum to job market needs • Suggestions on curriculum improvement and enhancing industry exposure.

Stakeholder	Feedback Area
	• Skills required for job/business success. • Extra-curricular facilities • Teacher-student relationship
Faculty	Feedback shall be collected on a bi-annual basis and captured using an app/portal developed for this purpose. • Satisfaction with respect with compensation and benefits • Opportunities for career development • Curriculum relevance • Infrastructure and facilities, including Laboratories. • Student Selection and admission process • Assessment methods • Appropriateness of student-faculty ratio, teacher-trainer ratio • Mental Health and Well Being • Workload • Facilities for Research and Innovation
Employers	• Academic Infrastructure and facilities at the institute • Relevance of the curriculum to job market needs • Suggestions on curriculum improvement and enhancing industry exposure. • Performance of Graduates / Interns
Parents	• Academic Infrastructure and facilities at the institute • Extra-curricular facilities • Teacher-student relationship • Overall Learning & Development • Mental Health and Well Being • Grievance redressal mechanism • Financial aid, Academic and Personal Counseling • Student timetable and workload

Stakeholder	Feedback Area
	• Health services and Sports & Physical Education • Canteen facilities

Table 20 : Feedback system for Quality Assurance

Ranking under top National and International Rankings

The proposed Deemed-to-be University plans to adopt best practices from national and international players to ensure that it can consistently feature in the top Institutions in the most reputed international (e.g., QS and THE) and national rankings (NIRF rankings). In

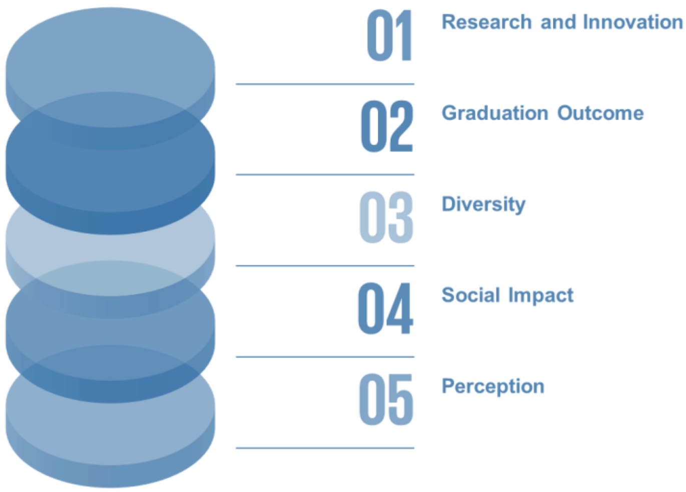

Figure 42 : Areas of focus for improving ranking.

line with several parameters that are adopted by reputed ranking/ accrediting agencies in India as well as abroad, the proposed Deemed-to-be University shall work on improving key ranking parameters, to ensure that it is regularly ranked among the best institutions across the world, as depicted in the figure 35.

There shall be focus upon certain key interventions under the five broad parameters mentioned in the image above – Research and Innovation; Graduation Outcome; Diversity; Social Impact and Perception. A brief description of the key initiatives that the proposed Deemed-to-be University will undertake to ensure excellence is provided in subsequent table.

Parameter	Envisaged Interventions
Research and Innovation	• Focus on consistently engaging in cutting edge applied research in line with the emerging trends. • Collaborate with leading global scientific research bodies, top engineering schools such as MIT and private sector players working in engineering, smart manufacturing, semiconductors, cybersecurity,

Parameter	Envisaged Interventions
	manufacturing design and AI etc., to develop solutions that directly affect lives of several people around the world. • Leverage collaborations to enhance research output-publish research articles, and file patents to ensure ownership of intellectual property of the proposed Deemed-to-be University
Graduation Outcome	• Fostering graduates who are not only experts in their chosen fields but also possess the global competencies and meta skills necessary for success in today's interconnected world. • Ensure aspirational placements that reflect the commitment to excellence. The curriculum will be designed to provide deep domain knowledge while also emphasizing critical thinking, problem-solving, and adaptability. • Offer extensive opportunities for international exposure, including exchange programs and collaborations, to enhance cross-cultural communication and understanding. • Prioritize all-round development by encouraging participation in extracurricular activities, leadership initiatives, and community engagement, ensuring our graduates are well-rounded individuals ready to make a significant impact globally. • Ensuring top-notch pedagogy that enables in imparting knowledge around the most critical subject areas of engineering and technology. • Aligning assessment mechanisms to industry requirements, focusing on both theoretical and practical knowledge, while assigning higher weightage to practical examinations -this shall ensure that the proposed Deemed-to-be University grooms its students in becoming hands- on, world-class manufacturing professionals adoptable in any industry. • Creating a culture that encourages students to voluntarily opt for higher degree and specializations, thereby making the proposed Deemed-to-be University a major talent pool for the country's manufacturing industry.
Diversity	• Ensuring diversity of students using both a national and an international lens • Leveraging its best-in-class infrastructure, the proposed Deemed-to-be University will curate specific outreach plans to attract a sizeable proportion of foreign students from different countries across continents

Parameter	Envisaged Interventions
Social Impact	• Adopt policies that make education accessible to all strata of society. • Focus on offering scholarships to candidates from underprivileged backgrounds, women, and especially abled candidates based on merit. This will not only ensure equitable access to quality education but also foster a diverse pool of talent that can drive industry innovations. By empowering these individuals, catalyze groundbreaking advancements and create a significant impact in various fields, ultimately contributing to societal progress and economic growth
Perception	• Collaborate with top industry and global academic players to organize guest lectures and conferences, increasing touchpoints and fostering knowledge exchange. • Engage alumni through regular updates, events, and networking opportunities to leverage their experience and connections. • Strengthen academia engagement by partnering with leading educational institutions for joint research projects, curriculum development, and faculty exchanges. • Organize seminars and conventions to provide platforms for discussion, innovation, and showcasing advancements in engineering and technology. • Engage all stakeholders including parents, government bodies, vendors, bankers, and the community to build a supportive ecosystem for students. • Leverage online marketing channels (social media marketing, website development, etc.) and traditional offline channels (marketing collaterals, pamphlets, newspaper advertisements, etc.) to increase top-of-mind awareness. • Promote community service initiatives to instill a sense of social responsibility and give back to society.

Table 21 : Initiatives for quality assurance and excellence

Accreditation from National and International Agencies

Accreditation from leading national and international agencies will help the proposed Deemed-to-be University in:

- Curriculum standardization to national/global standards,
- Assurance of high-quality teaching learning

- World-wide recognition of the programs offered.

The alignment with global and national best practices will help increasing the reputation and standing of the proposed Deemed-to-be University among the academic community and the industry. This in turn will improve the graduation outcomes of the students as well as result in improved intake quality as the proposed Deemed-to-be University will attract quality students nationally & internationally.

It will also help in building international academic and applied research collaborations – aligned with programs in emerging areas. The proposed Deemed-to-be University aligned to its commitment to quality education and applied research will strive towards acquiring international / national accreditations. The proposed Deemed-to-be University will have a robust internal quality assurance process which will enable the accreditation processes.

The proposed Deemed-to-be University plans to apply for accreditation as soon as it becomes eligible to do so. The accreditation process provides an added assurance that proposed Deemed-to-be University's quality assurance process is robust.

Accreditation Body	Significance
NAAC	National Assessment and Accreditation Council is the apex council of accreditation of HEIs in India under UGC. The purpose of NAAC is to provide accreditations to all HEIs in India.
ABET	Accreditation Board for Engineering and Technology (ABET) accredits college and university programs in the disciplines of applied and natural science, computing, engineering, and engineering technology at the associate, bachelor's, and master's degree levels
IET	Institution of Engineering and Technology (IET) awards academic accreditation to higher education programs that meet the UK Standard for Professional Engineering Competence (UK-SPEC) as outlined by the Accreditation of Higher Education Programs (AHEP). It accredits a range of subjects including electrical, electronic, manufacturing, mechanical, systems and software engineering including bioengineering, nanotechnology, and renewable energy

Table 22 : Relevant Accreditation bodies

The QAS will ensure the proposed Deemed-to-be University's sustained reputation for excellence and its ability to adapt to the evolving demands of higher education on a global scale.

7.9.2 Committees of proposed Deemed-to-be University.

The proposed Deemed-to-be University will have various committees in addition to the statutory committees and advisory boards, which will aid in the proposed Deemed-to-be University's smooth operation. These committees will adhere to the proposed Deemed-to-be University's goals and principles and supervise the proposed Deemed-to-be University's operations in accordance with their defined roles. It is critical to have sufficient representation of notable and respectable individuals from industry and academia, including individuals with strong credentials, on the committees. Committee composition will aim at diversity and gender equality, with women being represented on all committees. Below is the list of the committees:

Area	Committee	Objective
Industry Outreach	Industry Capstone Projects	Facilitate the integration of real – world industry challenges into students' capstone projects by providing strategic inputs to the faculty
	Innovation and Entrepreneurship	Drive culture of innovation and support the development of entrepreneurial skills and ventures among the students, fostering creativity, problem solving and business acumen
	Career Development	Cultivate a robust network of industry connections to create meaningful placement and internship opportunities for students, enhancing their professional development and employability
Employee Welfare	Professional Development	Offer strategic guidance and resources to enhance the skillsets and career progression of employees, aligning with organizational goals and industry trends
	Promotion and Recognition	Establishes transparent criteria and processes for employee promotions, awards, and recognition, fostering a culture of meritocracy and motivation within institution
	Employee Wellness & Health	Prioritizes the physical and mental wellbeing of employees by implementing initiatives and policies that promote healthy work environment, ultimately enhancing productivity and morale
Promotion of sustainability	Sustainability Strategy Cell	Ensure sustainability principles and practices are embedded within the Institute's core teaching and learning, governance, and operational activities.
Student Welfare	Student Wellness & Health	Prioritizes the physical and mental well – being of students, implementing initiatives and policies that promote healthy and support campus environment
	Student Council	Serves as a vital communication bridge between students and executive council, advocating for student needs and perspectives, and fostering vibrant and inclusive campus

Area	Committee	Objective
Outreach	Alumni Relations & Engagement	Maintains strong relationships with former students, facilitating meaningful connections and leveraging their experiences and expertise to strengthen the network
	International Affairs	Facilitates global engagement and collaboration by overseeing initiatives related to international partnerships, immersion progs. & enhancing institute's global footprint
	Media and Outreach	Foster community relations with internal and external stakeholders through several media relation activities
Institutional Operations	Finance and Budgeting	Offers strategic guidance and oversight in financial matters, including budget planning, allocation, and monitoring to ensure fiscal responsibility and sustainability for the proposed Deemed-to-be University's operations and initiatives
	Purchase / Procurement	Provides strategic inputs and recommendations for purchase and procurement decisions, optimizing resource allocation and ensuring cost-effective and quality acquisitions
	Event Planning and Coordination	Oversees decisions related to various events on campus, ensuring seamless planning, execution, and coordination to create impactful experience
Internal Institutional Committees	Internal Complaints Committee	Ensures a safe and respectful environment by addressing and resolving complaints, promoting a culture of fairness, equity, and accountability.
	Safety and Crime Prevention	Ensure a secure and safe environment for all members of the proposed Deemed-to-be University, implementing proactive measures and protocols to prevent & respond to concerns
	Anti Ragging	Promote culture of respect and inclusion by enforcing policies and practices that prohibit any form of ragging or harassment, creating a nurturing and conducive learning environment for all students
	PoSH	Addresses and prevents incidents of sexual harassment, providing a confidential and supportive process for reporting and resolving such cases
	Disciplinary Committee	Upholds policies and code of conduct by addressing disciplinary matters to ensure fair and consistent enforcement of rules

Area	Committee	Objective
	Diversity and Inclusion	Promotes culture of diversity, equity, and inclusion by implementing policies and initiatives that celebrate and support all forms of diversity

Table 23 : Committees of the proposed Deemed-to-be University.

In conclusion, the administration plan for the proposed Deemed-to-be University is designed to foster a robust and dynamic environment that prioritizes quality assurance, comprehensive student services, alumni engagement, and effective governance through various committees. By implementing these strategic initiatives, the aim is to create a supportive and enriching educational experience that not only meets but exceeds the expectations of stakeholders. The commitment to continuous improvement and excellence will ensure that the proposed Deemed-to-be University remains a leader in higher education, preparing students for successful futures and contributing positively to society.

7.10 Plan for Student Experience

This section provides an overview of the strategic plan for focusing on student journey, placements, and alumni engagement. The approach integrates various elements to form a cohesive framework designed to uphold the standards and promote engagement within and outside the proposed Deemed-to-be University.

7.10.1 Plan for Student Journey

The Student Experience of the proposed Deemed-to-be University will play an integral role in shaping the holistic experience of students at the Institution. From their first interaction with the proposed Deemed-to-be University during the application process to their transition into engaged alumni, every stage of the student journey is supported by a wide range of services that ensure a seamless and enriching academic, social, and personal experience. It will serve as the primary touchpoint for all student-related interactions, designed to provide comprehensive support, guidance, and resources across various dimensions of student life.

Each student's journey is marked by critical milestones, including applying to the institution, registering for courses, selecting academic modules, and navigating their academic life. Equally important are the elements that contribute to their personal and social development, such as accommodation, transportation, health and wellness services, social engagement, and career development. Recognizing the interconnectedness of these experiences, the proposed Deemed-to-be University is committed to offering a well-rounded support system that not only meets the immediate needs of students but also prepares them for long-term success and well-being.

The proposed Deemed-to-be University will provide a holistic learning environment that extends beyond academics. Career advancement services offer comprehensive guidance and support for resume building, interview preparation, job placement, personalized counseling, internships, and industry connections to ensure successful transitions. The campus will host diverse events, workshops, and seminars that foster networking opportunities, skill development, and cultural enrichment. The co-curricular activities promote exploration, and skill development through projects, competitions, community service, blending teamwork, critical thinking, and creativity. Additionally, it is planned to have numerous student-run clubs and societies to provide a dynamic space for students to pursue interests, cultivate leadership skills, and connect with like-minded individuals, covering many areas including arts, culture, sports, and technology.

The proposed Deemed-to-be University will balance academic rigor with personal growth and community building. To achieve this, we plan to strategically repurpose non-learning spaces into dynamic areas that foster social connection, creativity, and relaxation. From collaborative workspaces to recreational zones, these areas provide students with opportunities to unwind, explore interests, and connect, complementing our academic programs and enriching the overall student experience.

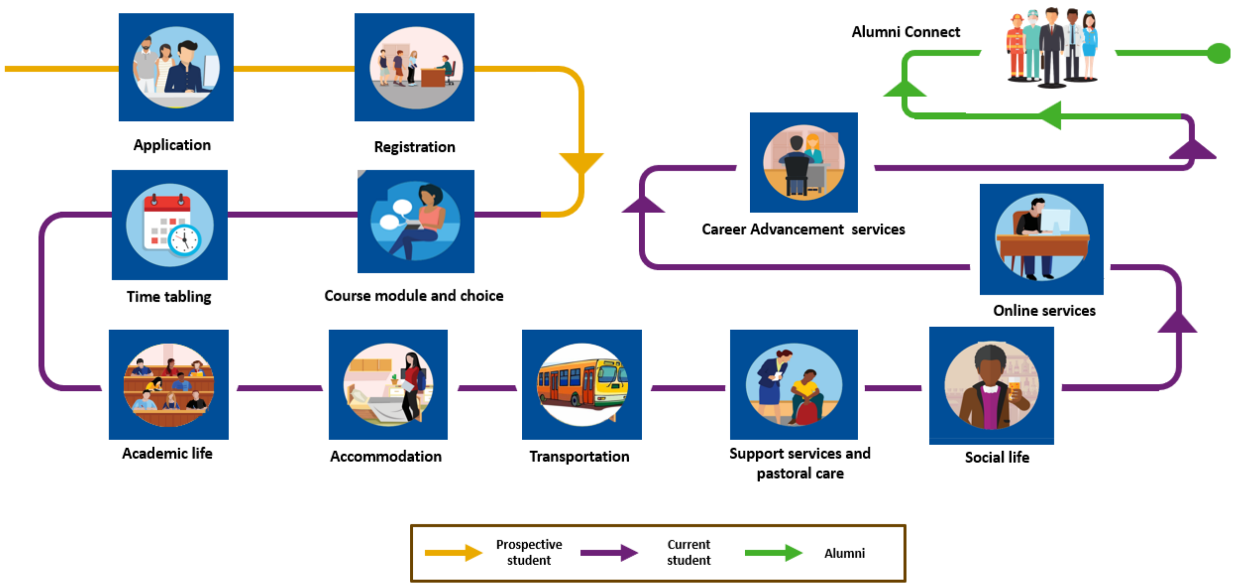

Figure 43 : Student Journey Touchpoints

A core aspect will be the ability to evolve and adapt to the changing needs of students over time. In the early years, the focus will be on building and launching essential services that address each touchpoint of a student's journey, ensuring that the foundation for a positive student experience is laid out effectively. Over the following years, these services will be enhanced and upgraded to meet the growing expectations of a diverse student body, incorporating technological advancements and feedback from the campus community. In the final phase of the 15-year strategy, there will be shift towards ensuring operational efficiency and sustainability, with only necessary adjustments being made to maintain a high standard of service delivery.

1 – 5 Year Plan

- Establish a streamlined, digital-first platform for handling applications, registrations, and enrollments. This system will be designed to simplify the onboarding process, provide transparency, and offer personalized support through automated notifications and live assistance.
- Set up systems for flexible course module selection, integrating a digital platform that allows students to tailor their schedules and academic pathways.
- Launch accommodation services with a focus on comfort, safety, and community. Complement this with transportation solutions to ensure students have access to reliable mobility options, including shuttle services.

• Implement health and wellness programs, covering physical and mental health services, counseling, and support initiatives. Promote well-being through workshops, wellness activities, and access to on-campus and telehealth services. • Establish avenues for student engagement through clubs, extracurricular activities, and campus events, creating a vibrant community. Ensure all services are accessible online, with a centralized portal for academic and personal needs. • Develop a career services office offering career counseling, internship placements, mentorship program with faculty, and job opportunities. • Establish a system for orientation of students. • Encourage student participation in hackathons, competitions, and social initiatives
6 – 10 Year Plan
• Upgrade the application, registration, and enrollment platforms with AI-driven tools for personalized student support and real-time assistance. Introduce predictive analytics for course module choices and academic planning, offering students more tailored academic pathways. • Expand and modernize accommodation facilities, introducing smart housing solutions that offer a better quality of living. Enhance transportation options by partnering with local providers to introduce more sustainable and convenient mobility choices. • Scale wellness services, adding more comprehensive mental health programs and wellness workshops. • Career services will be expanded to provide deeper industry engagement, internships, and job placement programs, focusing on global opportunities. • Expand the capabilities of the online services platform, integrating it with more advanced tools for communication, collaboration, and real-time updates. Enhance student engagement through new social and leadership opportunities that foster a stronger sense of community and inclusion
11 – 15 Year Plan
• Continuously monitor and refine the digital platforms for applications, enrollment, and academic services, ensuring they are up to date with technological trends and user expectations. Introduce minor upgrades as necessary to maintain efficiency. • Maintain the wellness and career services at peak performance, with minor adjustments made as needed to respond to evolving student needs. Focus on ensuring that career support remains relevant and aligned with emerging industry trends.

Table 24 : 15 Year Plan for Student Experience

Through this strategic plan, the proposed Deemed-to-be University aims to foster a supportive, inclusive, and dynamic environment that empowers students to thrive academically and personally. By integrating academic services with personal support systems, student services will play a crucial role in creating a fulfilling and engaging student experience that contributes to the overall mission of the institution—producing graduates who are not only academically accomplished but also well-prepared for life beyond the proposed Deemed-to-be University.

7.10.2 Plan for Placements

Placements are pivotal to the success of the proposed Deemed-to-be University, bridging academia and industry to ensure high employability, global competitiveness, and societal impact. The placements will be designed to achieve:

Figure 44 : Objectives of the placement process

<u>Setting up a Placement Cell</u>

A well-structured placement cell will play a crucial role in creating a dynamic interface between students, faculty, and the corporate world.

The Placement Cell will be established with the following key components:

A. Infrastructure:

- A dedicated office equipped with video conferencing facilities and interview room(s)
- AI-enabled placement management software to streamline recruitment schedules, maintain student databases, and generate analytics for industry trends.

B. Team Structure:

- **Placement Head:** Overall strategy, industry tie-ups, and execution.
- **Corporate Relations Officers (CROs):** Regional specialists to liaise with companies across India and globally.
- **Placement Coordinators:** Department-specific coordinators to address domain-specific recruitment needs.

- **Soft Skills Trainers:** Dedicated trainers to improve communication, leadership, and personality development.

C. Functions:

- Organize recruitment drives, internships, and industry workshops.
- Provide career counseling and mentorship to students.
- Regularly update industry connections through alumni networks and corporate visits.

In addition to the above, a Student Placement Committee (SPC) consisting of at least 5 students will be set up to assist the placement cell in:

- Conducting peer-to-peer training and mock interviews.
- Collecting and analyzing feedback on recruitment processes.
- Maintaining transparent communication with the student body.

These students will be selected through a defined selection process decided by the Placement director.

<u>Placement process and indicative timeline</u>

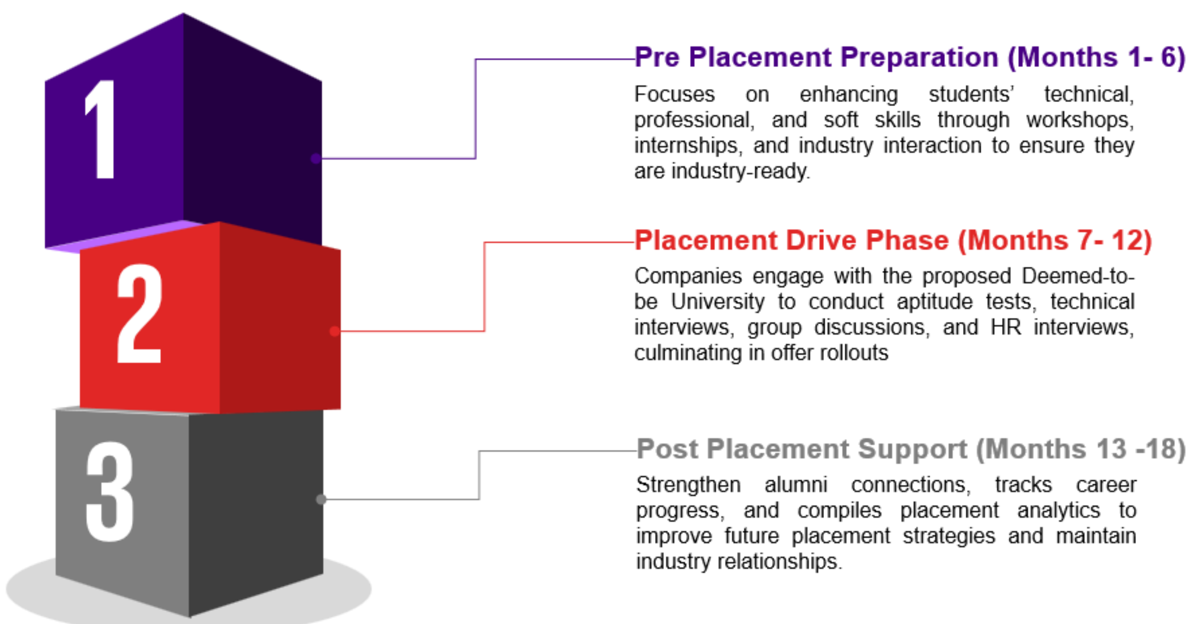

Figure 45: Placement process and indicative timeline

A. Pre-Placement Preparation (Months 1–6)

i. Curriculum Integration: Align coursework with industry needs through feedback from recruiters and professional bodies.

ii. Skill Development Programs:

- Workshops on emerging technologies like AI, IoT, and EV design.
- Training in coding, analytics, and simulation tools specific to each domain.
- Soft skills development for resume writing, group discussions, and public speaking.

iii. Industry Internship Capstone Project:

- 3 months of mandatory Industry Internship Capstone Project with partner organizations, offering practical exposure.
- Encourage participation in competitions, hackathons, and industrial visits.

iv. Industry Engagement:

- Host industry talks, webinars, and guest lectures by experts from companies like Siemens, Micron, and ABB.
- Collaborate with industry bodies like CII, NASSCOM, and FICCI for sector-specific guidance.

v. Placement Awareness:

- Conduct orientation sessions for students about job opportunities, career paths, and industry expectations.

B. Placement Drive Phase (Months 7–12)

i. Recruiter Outreach (Months 7 - 8):

- Invite companies through formal letters and share detailed placement brochures.
- Provide access to a dedicated online portal with student profiles and academic credentials.

ii. Pre-Placement Talks (Months 8 - 9):

- Companies present job roles, salary packages, and career growth paths to students.
- Allow students to clarify queries regarding job expectations.

iii. Selection Process (Months 10 - 11): Conduct multi-stage recruitment:

- Aptitude Tests: General and domain-specific tests to shortlist candidates.
- Technical Interviews: Assess technical expertise and problem-solving abilities.
- HR Interviews: Evaluate cultural fit, communication skills, and motivation.
- Group discussions and situational judgment tests for managerial roles.

iv. Offer Finalization (Months 11 - 12):

- Companies roll out offer letters.
- Students and placement officers coordinate on joining timelines and documentation.

C. Post-Placement Support (Months 13–18)

i. Alumni Engagement: Use alumni as ambassadors to strengthen ties with their organizations and mentor current students.

ii. Career Tracking: Regular follow-up with recruiters to assess graduate performance and gain feedback.

iii. Placement Analytics: Compile annual placement reports for internal review and external accreditation purposes.

Indicative sectors and companies for the graduates

S.no	Program offering	Indicative Sectors	Indicative Companies
1	Masters in Smart Manufacturing Technology and Management	Industries focusing on IoT-enabled factories, digital twins, and automation.	• Siemens • Fanuc • Bosch • ABB
2	Masters in Automotive Systems Technology and Management	Industries focusing on Electric vehicles (EVs), autonomous vehicles (AVs), and connected mobility	• Maruti Suzuki • Eicher • Mahindra • MG Motors
3	Masters in Semiconductor Manufacturing Technology and Management	Chip fabrication plants, IC design companies, and research facilities.	• Intel • TSMC • Applied Materials • Micron

S.no	Program offering	Indicative Sectors	Indicative Companies
4	Masters in Sustainable Engineering and Management	Renewable energy companies, eco-friendly product manufacturers, and green construction firms.	• Siemens • Schneider Electric • NTPC • Suzlon
5	Masters in Robotics Engineering and Management	Industrial automation firms, robotics hardware developers, and AI-integrated machinery companies.	• Festo • Micron • ABB • Siemens

Table 25 : Indicative Sectors and Recruiting Companies

The below indicated 15-year strategic vision will ensure that the proposed Deemed-to-be University becomes a leading destination for both recruiters and students, contributing significantly to India's skilled workforce and technological leadership.

1 – 5 Year Plan

- Establish a fully functional Placement Cell with cutting-edge facilities, including online placement portals and skill-assessment labs.
- Form a dedicated team of placement officers, corporate relations managers, and trainers.
- Organize industry talks, webinars, and guest lectures by experts from companies like Siemens, Micron, and ABB.
- Conduct orientation sessions for students about job opportunities, career paths, and industry expectations.
- Develop placement collaterals and a dedicated online portal for placement process.
- Incorporate mandatory skill development programs, industry-specific certifications and hands-on training aligned with the proposed Deemed-to-be University's niche domains.
- Sign MOUs with 30+ industry leaders across sectors like smart manufacturing, robotics, and semiconductors.
- Organize annual Industry-Academia Summits to foster relationships and secure recruitment commitments.
- Build a placement database to track trends and feedback for continuous improvement.
- Develop a professional placement brochure and website.
- Leverage alumni and advisory board members to establish the Deemed-to-be University's reputation

6 – 10 Year Plan
• Establish regional corporate liaison offices in major cities (Bengaluru, Pune, Hyderabad, and Delhi) to strengthen ties with industries. • Deploy AI-enabled tools for tracking industry trends, automating recruitment processes, and personalizing student preparation. • Collaborate with international companies for overseas placement opportunities in the fields of semiconductors, EVs, and robotics. • Partner with global industry bodies like IEEE and SAE for knowledge sharing and recognition. • Enhance internships and capstone projects by targeting placements with Fortune 500 companies. • Establish an active alumni association to mentor students and provide strategic insights on industry trends. • Launch an alumni-student referral system to facilitate job placements and internships.
11 – 15 Year Plan
• Transform the Placement Cell into a dedicated Career Development Center offering lifelong career support to alumni. • Secure tie-ups with multinational corporations to recruit students for roles in global tech hubs (e.g., Silicon Valley, Singapore, Germany). • Host international placement drives and job fairs. • Facilitate co-op programs where students alternate between studies and working on industry projects. • Ensure the proposed Deemed-to-be University is ranked among the top 5 institutions for placements in India and the top 50 globally.

Table 26: 15 Year Plan for Placements

This detailed placement plan highlights the proposed Deemed-to-be University's commitment to integrating academic excellence with employability. By aligning with national and global industry needs, the proposed Deemed-to-be University will produce techno managerial workforce capable of driving technological innovation and sustainable development. With a structured and comprehensive placement process, the proposed Deemed-to-be University will contribute to India's evolving higher education ecosystem and bolster its industrial competitiveness.

7.10.3 Plan for Alumni Connect

As the alma mater's brand ambassadors' alumni play a key role in facilitating the growth and enhanced brand value of the institute. They help facilitating opportunities and collaborations for students and faculty with the industry as well as may even set up scholarship funds for students.

Figure 46 : Alumni Engagement Framework

The aim of alumni engagement is to cultivate a symbiotic relationship wherein the alumni feel valued, stay connected, and contribute to the proposed Deemed-to-be University's evolving growth narrative. The proposed Deemed-to-be University will form an alumni engagement cell which will take up the engagement activities as listed below.

1 – 5 Year Plan: Foundation building	
Establish Alumni Relations Office	• Create a dedicated team focused on alumni engagement. • Define goals and objectives for alumni relations.
Database Development	• Build a comprehensive alumni database. • Collect and regularly update contact information.
Initial Communication	• Launch a welcome campaign for graduates. • Utilize email, social media, and newsletters to keep alumni informed
Create Alumni Networks	• Establish regional and interest-based alumni chapters. • Encourage alumni to connect with each other.
Engagement Events	• Organize events such as homecoming, networking nights, and guest lectures. • Foster a sense of community among graduates.

6 – 10 Year Plan: Expansion and deepening engagement	
Mentorship	• Develop professional development workshops and seminars. • Offer mentorship programs connecting current students with alumni.

Increased Communication	• Implement regular newsletters highlighting alumni achievements and university news. • Utilize social media platforms for real-time engagement.
Feedback Mechanisms	• Survey alumni to understand their needs and interests. • Use feedback to tailor programs and initiatives.
Alumni Recognition	• Establish awards or recognition programs to honor outstanding alumni. • Share success stories through various channels.
Fundraising Initiatives	• Introduce alumni giving programs, emphasizing the impact of contributions. • Create easy pathways for donations and involvement in fundraising events.
11 – 15 Year Plan: Sustaining and innovating engagement	
Long-term Engagement Strategies	• Develop strategies to maintain connections with alumni as they progress in their careers. • Create lifelong learning opportunities through online courses or lectures
Alumni Advisory Boards	• Form advisory boards for alumni input on programs and initiatives. • Involve alumni in strategic planning for the university.
Global Outreach	• Expand global alumni networks and connections. • Host international alumni events to engage those living abroad
Leverage Technology	• Use platforms for virtual events and networking. • Implement a mobile app for alumni to stay connected with university activities
Legacy Programs	• Encourage alumni to get involved in creating scholarships or endowments. • Foster a culture of giving back to the university.

Table 27 : 15 Year Plan for Alumni Engagement

7.11 Plan for Governance Structure

This section details the roles and responsibilities of key officers, authorities, and other bodies, ensuring accountability and strategic alignment with the proposed Deemed-to-be University's vision and mission. The governance framework, in alignment to UGC's Deemed-to-be University Regulation 2023, is designed to support informed decision-making, foster collaboration across departments, and uphold the highest standards of integrity and compliance. By clearly delineating responsibilities, the governance structure will provide stability, promote ethical practices, and enable the proposed Deemed-to-be University to respond adeptly to both challenges and opportunities.

The proposed Deemed-to-be University shall have transparent, effective, and responsible governance to achieve its objectives. Key guiding principles of the governance structure are listed below.

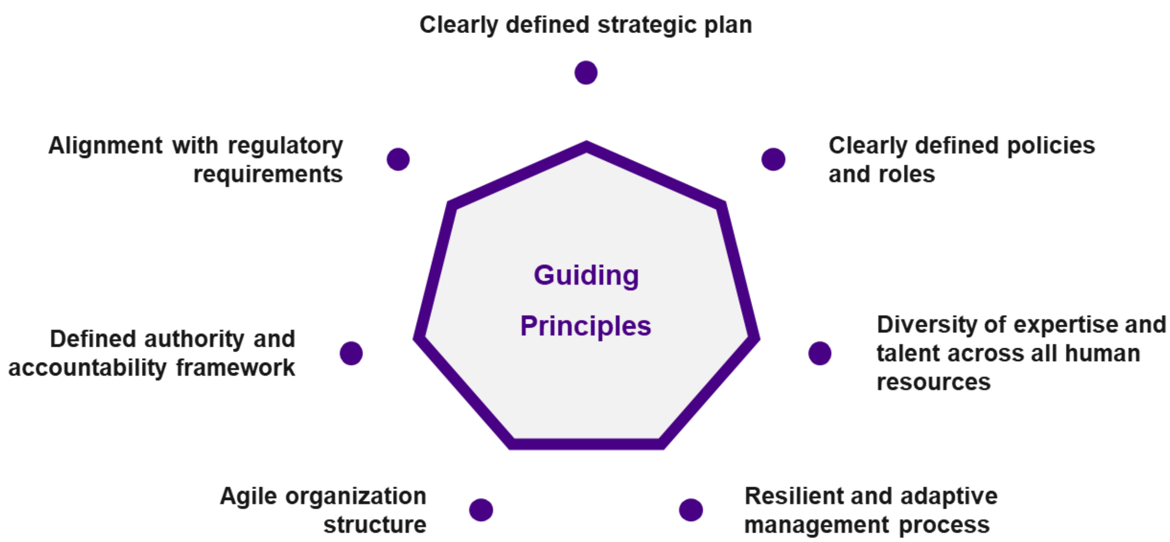

Figure 47 : Guiding principles of the governance

The proposed Deemed-to-be University shall develop governance policies to ensure transparency, Fairness & Equity, professional ethics, and compliance with regulations. These shall further ensure effective implementation of strategic plans and adherence to statutory compliances supported by necessary MIS.

The proposed Deemed-to-be University shall adopt a transparent approach to structure its organization into hierarchy appropriate for quick decision making aligned with laid down policies and quality processes.

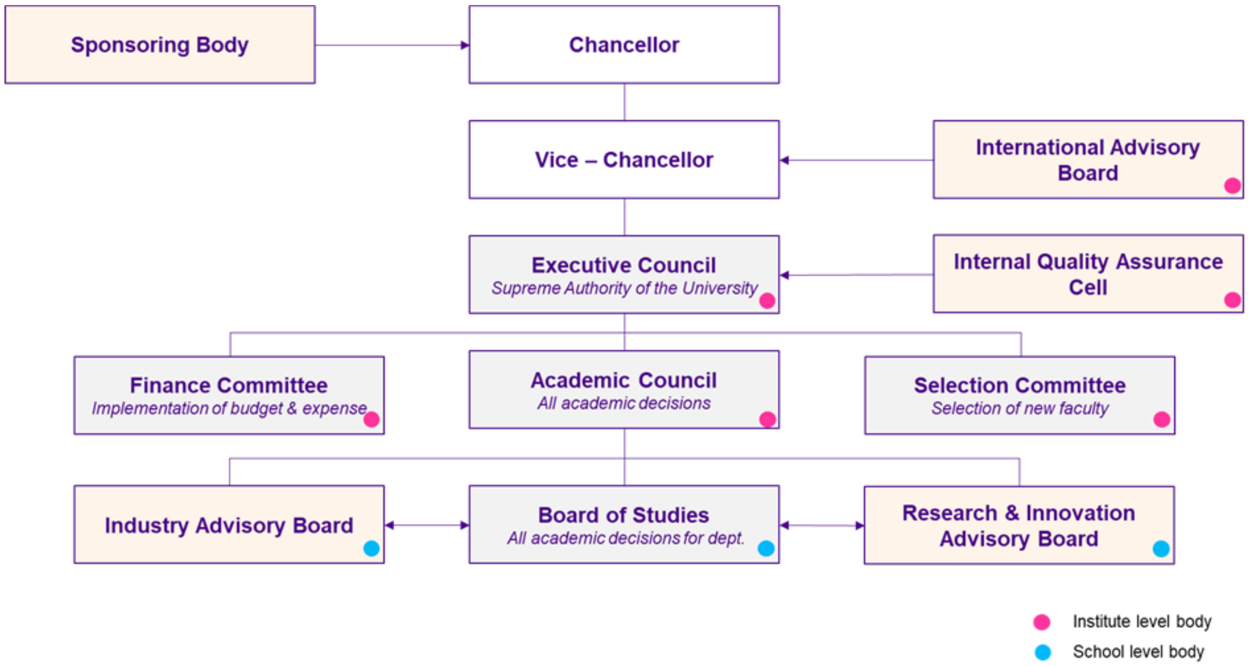

Figure 48 : Proposed governance structure

The proposed Deemed-to-be University's organization structure will be composed by the officers and authorities of the University.

- **Officers of the Deemed-to-be University** shall include the Chancellor, Vice Chancellor, Registrar, Finance Officer, Controller of Examinations, Dean, Head of Schools. The appointment of officers will as per UGC Deemed-to-be University Regulation 2023
- **Authorities of the Deemed-to-be University** shall include Executive Council, Academic Council, Finance Committee, Board of Studies, and Selection Committee as defined by the UGC Deemed-to-be University Regulation 2023

7.11.1 Officers of the proposed Deemed-to-be University.

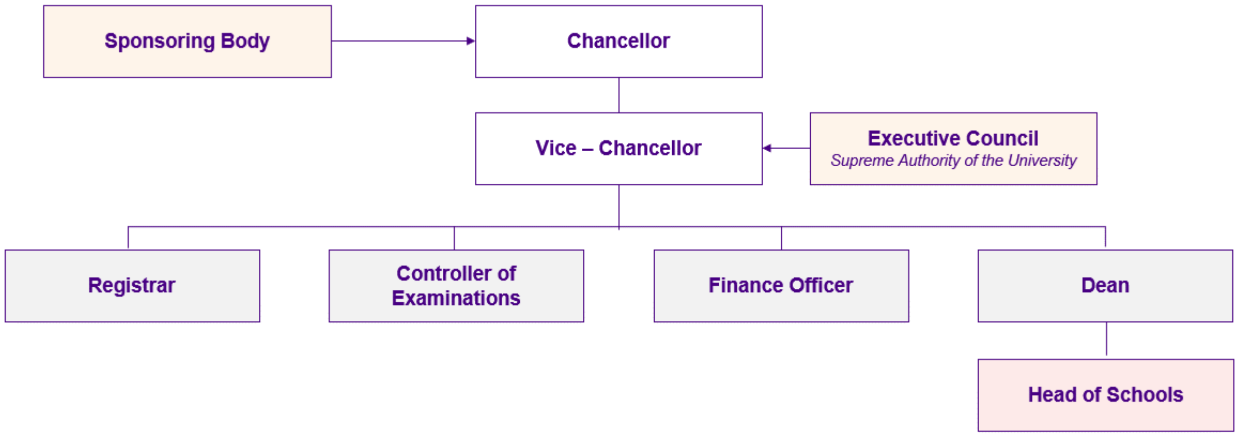

Figure 49 : Hierarchy among officers of the proposed Deemed-to-be University.

The **Chancellor** shall, by virtue of his or her office, be the head of the institution Deemed-to-be University and shall, if present, preside at the Convocations of the institution Deemed-to-be University held for conferring degrees

The **Vice-Chancellor** shall be a whole-time salaried officer of the institution Deemed-to-be University and shall be the Principal Executive Officer and academic officer of the institution Deemed-to-be University and shall exercise general supervision and control over the affairs of the institution Deemed-to-be University and give effect to the decision of all authorities of the institution Deemed-to-be University.

The **Registrar** shall be a whole-time salaried officer of the institution Deemed-to-be University and shall have the power to take disciplinary action against employees, excluding teachers and other academic staff.

The **Finance Officer** shall be a whole-time salaried officer of the institution Deemed-to-be University and shall exercise general supervision over the funds of the institution Deemed-to-be University and advise it as regards its financial policy; and perform such other financial functions

The **Controller of Examination** shall arrange for and superintend the examinations of the institution Deemed-to-be University in the manner as may be prescribed by the rules of the institution Deemed-to-be University.

The **Dean of Academics** shall be the Head of the faculty and shall be responsible for the conduct and maintenance of the standards of teaching and research in the schools and shall have such other functions as may be prescribed by the rules of the institution Deemed-to-be University.

There shall be a **Program Director** who will act as the head of the department for each of the schools in the institution Deemed-to-be University.

7.11.2 Authorities of the proposed Deemed-to-be University.

Executive Council

The Executive Council shall be the highest governing principal executive body of the institution, headed by the Vice-Chancellor and consisting of ten to thirteen members. The Executive Council shall be the final decision-making body of the proposed Deemed-to-be University in respect of every matter, including academic, administrative, personnel, financial, and developmental matters.

Key responsibilities of the Executive Council will include the following:

- Management and administration of the proposed Deemed-to-be University.
- Appointment of Professors, Associate Professors, Assistant Professors, and other academic staff, as may be necessary, on the recommendation of the Selection Committee constituted for the said purpose and to fill up temporary vacancies.
- Regulate and enforce discipline amongst the employees of the institution in accordance with the rules of the institution.
- Provide for the appointment of Visiting Professors, Emeritus Professors, Professor of Practice, Consultants, Scholars, etc., and determine the terms and conditions of such appointments.
- Executive Council shall exercise such other powers and perform such other duties as may be conferred or imposed on it by the rules and regulations of the institution.
- Make rules and regulations for the institution Deemed-to-be University.

S. No	Affiliation and Designation	Number
1	Vice – Chancellor – Chairperson	1
2	Pro – Vice – Chancellor	1
3	Program Director (Dean of School)	2
4	Professor	1
5	Associate Professor	1
6	Assistant Professor	1
7	Nominee from Sponsoring Body	4
8	Registrar (ex-officio Secretary)	1
	Total Members	**12**

Table 28 : Proposed composition of the Executive Council

Academic Council

The Academic Council shall be the principal academic body of the Deemed-to-be University which be responsible for co-ordination and exercising general supervision over the academic policy of the institution. The council will be headed by the Vice-Chancellor and consisting of up to 25 members.

Key responsibilities of the Academic Council will include the following:

- Provide directions regarding methods of instruction, co-ordination of teaching among faculties or schools, evaluation of applied research and improvement of academic standards.
- Bring about and promote inter-faculty and inter-school and to establish or appoint such committees or boards, as may be deemed necessary for the purpose.
- Consider matters of general academic interest either on its own initiative, or on a reference by a faculty or school or the Executive Council, and to take appropriate action.
- Prescribe courses of study leading to degree and diploma of the institution
- Plan for the conduct of examinations in conformity with the rules and of the institution and maintain proper standards of the examination.
- Recognize diplomas and degrees of universities and other Institutions and to determine equivalence with the diplomas and degrees of the institution.
- Institute Fellowships, Scholarships, Medals, Prizes, etc.
- Frame rules covering the academic functioning of the institution Deemed-to-be University, admissions, examinations, award of fellowships and studentships, free-ships, concessions, attendance, discipline, residence, etc.
- Take a periodical review of the activities of the schools to take appropriate action to maintain and improve the standards of instruction.
- Recommend the institution of teaching posts (Professors, Associate Professors, and Assistant Professors) to the Executive Council
- Make recommendations to the Executive Council for the establishment or abolition of schools or faculties.
- Exercise such other powers and to perform such other duties, as may be conferred or imposed upon it by the rules of the institution.

S. No	Affiliation and Designation	Number
1	Vice – Chancellor / Chairperson	1

S. No	Affiliation and Designation	Number
2	Pro – Vice – Chancellor	1
3	Program Director (Dean of School)	4 (from each school)
4	Professor	5 (one from each school)
5	Associate Professor	3 (each from a different school)
6	Assistant Professor	3 (each from a different school)
7	External Educationist/ Expert	6
8	Registrar (ex-officio Secretary)	1
	Total Members	**24**

Table 29 : Proposed composition of the Academic Council

Finance Committee

Nodal body responsible for financial oversight and budgetary decisions.

Key responsibilities of the Finance Committee will include the following:

- Examine the accounts and scrutinize the proposals for expenditure.
- Examine all proposals relating to the creation of posts and those items which have not been included in the budget.
- The annual accounts and financial estimates of the institution by the Finance Officer shall be laid before the Finance Committee for consideration and comments.
- Recommend limits for the total recurring and non-recurring expenditures for the year, based on the income and resources of the institution.

S. No	Affiliation and Designation	Number
1	Vice – Chancellor – Chairperson	1
2	Pro – Vice – Chancellor	1
3	Member Nominated by the society/ trust/ company	1
4	EC Member who is also nominated by EC	1
5	Member Nominated by EC	2
6	Member Nominated by Chancellor	3
7	Chief Finance Officer (Secretary- ex officio)	1
	Total Members	**10**

Table 30 : Proposed composition of the Finance Committee

Dedicated Board of Studies for each of the five schools

The Board of studies, formed on a school level shall be responsible for recommending study programs, course curricula, projects and enhance the quality of teaching and research. The Board of studies will work under overall control and supervision of the Academic Council.

Key Responsibilities of the Board of Studies will include the following:

- Recommend and approve subjects for research for various degrees and other requirements of research degrees.
- Recommend courses of studies
- Recommend appointment of supervisors for research
- Recommend measures for the improvement of the standards of teaching and applied research.

S. No	Affiliation and Designation	Number
1	Program Director (Dean of School)	1
2	Professor	3
3	Associate Professor	2
4	Assistant Professor	2
5	External Industry Expert	1
6	External Academic Expert	1
	Total Members	**10**

Table 31 : Proposed composition of the Board of Studies

Selection Committee for appointment of teaching staff

Key responsibilities of the Selection Committee will include the following:

- Making recommendations to the Executive Council for appointment to the post of Professors, Associate Professors, Assistant Professors, and such other posts as may be prescribed, in accordance with the UGC (Minimum Qualifications for Appointment of Teachers and other Academic Staff in Universities and Colleges and other Measures for the Maintenance of Standards in Higher Education) Regulations, 2018.
- Making recommendations to the Executive Council for appointment of Registrar
- Making recommendations to the Executive Council for appointment of the Chief Finance Officer

- Making recommendations to the Executive Council for appointment of the Controller of Examination

S. No	Affiliation and Designation	Number
1	Vice Chancellor (Chairperson)	1
2	Nominee of the Chancellor	1
3	Two members of the Executive Council nominated by it	2
4	Expert not in the service of the University to be nominated by the Executive Council	1
	Total Members	**6**

Table 32 : Proposed composition of the selection committee

Search-cum-Selection Committee (SCSC) for appointment of Vice Chancellor

Key responsibilities of the Search-cum-Selection Committee will include the following:

- Making recommendations (3 names) to the Chancellor for the position of Vice-Chancellor

S. No	Affiliation and Designation	Number
1	Reputed academician (Nominated by Chancellor)	1
2	Nominee by Chairman of UGC	1
3	Academician with more than 10 years of experience (Nominated by the Executive Council)	1
	Total Members	**3**

Table 33 : Proposed composition of the Search-cum-Selection committee

7.11.3 Other relevant authorities of the proposed Deemed-to-be University.

International Advisory Board

The Board will consist of distinguished academicians, internationally renowned Subject Matter Experts, and researchers.

Key Responsibilities of the International Advisory Board will include the following:

- The board will be tasked with guiding the proposed Deemed-to-be University towards achieving Excellence as per global standards.

- Gearing the proposed Deemed-to-be University towards pursuit of path-breaking innovation, adoption of, internationally benchmarked best practices, and advising on internationalization of the proposed Deemed-to-be University.

The below members will be a part of the International Advisory Board at the proposed Deemed-to-be University:

Dr Pinakin Chaubal

Dr Pinakin Chaubal is currently serving as the Vice President and Chief Technology Officer at ArcelorMittal, with a career spanning over three decades in the metallurgy and technology sectors. His expertise lies in process metallurgy, and he has held various roles in **research, operations, and technology**.

Dr Chaubal began his career at Inland Steel, USA in 1987 and joined ArcelorMittal in 1998 following an acquisition. In 2007, he took the role of General Manager and was responsible for process research and development at ArcelorMittal's global **R&D division** in Europe. Returning to the US in 2014, he became Head of Research Management for the Americas. His role expanded as he continued to serve as the Process Portfolio Leader and a member of the global R&D leadership team. Dr Chaubal holds a PhD from the University of Utah and a Bachelor of Technology (BTech) from IIT Madras

Dr Leena Srivastava

Dr. Leena Srivastava is a global leader in the fields of **energy economics and sustainable development**. She is currently an independent non-executive director on the boards of prominent organizations such as Shell, Bharti Infratel, Shree Cement, Caterpillar Inc., Cairn Energy, Vedanta Resources, and Consocia Advisory India, where she guides organizations towards sustainable practices.

She previously held the position of Deputy Director General for Science at The International Institute for Applied Systems Analysis in Vienna and served as Executive Director and Vice-Chancellor of the TERI School of Advanced Studies in New Delhi.

She is also involved in global advisory positions, including the co-chair of Future Earth and member of influential advisory boards such as the Asian Development Bank. Her ongoing commitment to sustainable development is also reflected in her membership in the **SDG 7 Technical Advisory Group** and the Advisory Board of the ‘Science for Sustainable Societies’ book series. She holds PhD in Energy Economics from IISc Bangalore and a master’s degree in economics from the University of Hyderabad.

Mr. Bruce Poh

Mr. Poh is currently serving as the CEO of ITE Education Services (ITEES) in Singapore. His career spans across **engineering, economic development, and education**. After working at Hewlett Packard and the Economic Development Board, his appointment as Assistant Director of the French-Singapore Institute and Japan-Singapore Technical Institute brought is role to fostering international collaborations in education and technology. Mr. Poh played a key role in establishing Nanyang Polytechnic in 1992, held multiple positions including **Deputy Principal, Director of Information Technology, Design, Business Schools, and the Centre for Quality**.

In 2007, he was appointed as the **CEO of the Institute of Technical Education (ITE)** by Singapore's Ministry of Education, a position he held for a decade. During his tenure, he significantly shaped ITE's direction and enhanced its outreach through Technical and Vocational Education and Training (TVET). Now at ITEES, Mr. Poh continues to advance TVET systems globally by providing consultancy services to foreign governments and private entities. Mr Poh is an MBA graduate from the National University of Singapore.

Dr Ashish Nanda

Dr Ashish Nanda is currently serving as a **Senior Lecturer and 'C. Roland Christensen' Distinguished Management Educator** at both Harvard Business School and Harvard Law School. At Harvard, he also serves as the course head for the MBA.

He served as the **Director of IIM Ahmedabad** from 2013 – 2017. Dr Nanda's also has an experience with professional service and human capital-intensive organizations has positioned him as a thought leader in this critical field as he served as a non-executive director on the boards of public companies, private firms, partnerships, not-for-profit organizations, and academic institutions. He holds a PhD from Harvard University, a PGDM from IIM Ahmedabad and a B. Tech from IIT Delhi.

Dr Vijay Kumar Saraswat

Dr Vijay Kumar Saraswat is a renowned **Indian scientist and member of NITI Aayog**. He has had a successful career in defence research and innovation technology. During his time as Director General of the Défense Research and Development Organization (DRDO), he was instrumental in the creation of notable missile systems like Prithvi, Dhanush, Prahaar, and Agni-5.

As **Secretary of the DRDO**, he made significant contributions to the development of nuclear assets, cruise missiles, and cybersecurity. In addition, Dr Saraswat has also worked on clean coal technologies, solar power, and spearheaded initiatives like the

Photonics Valley Corporation and the Indian microprocessor development program. He received multiple accolades, including Padma Shri and Padma Bhushan awards and honorary degrees from over 25 universities for his distinguished career. He has a doctorate from Osmania University and a master's degree in engineering from the Indian Institute of Science.

Dr Krishnan Balasubramanian

Prof. Balasubramanian is a **distinguished Institute Professor in the Department of Mechanical Engineering at IIT Madras**, and currently leading the Centre for Non-destructive Evaluation since its founding in 2001. He also is the Faculty in Charge of Gopalakrishnan Deshpande Center for Innovation and Entrepreneurship, Accenture Center for Product X, and **the Center for Advanced Automotive Research**. He also served as the Dean, **Industrial Consulting and Sponsored Research** at IIT Madras between 2012-18. With over 40 years of experience in Non-destructive evaluation, his work spans maintenance, quality assurance, manufacturing, and design. He is actively engaged in innovation; he is instrumental in incubating 10 startups that employ more than 1100 professionals and operate across 12 countries.

Besides, the key authorities of the proposed Deemed-to-be University, there will be two advisory boards as follows which will work on the school level:

Research & Innovation Advisory Board: The Board will consist of accomplished researchers and domain experts from industry, government, academia, and research institutions.

Key Responsibilities of the Research & Innovation Advisory Board will include the following:

- The board will be responsible for providing guidance and strategic oversight for achieving excellence in Innovation and research.
- Advising the university on research focus areas and improving research outcomes

Industry Advisory Board: The Board will consist of distinguished people from Industry.

Key Responsibilities of the Industry Advisory Board will include the following:

- Inputs on curriculum and program structure to be industry relevant.
- Brining in prospects for career development and placement opportunities for students.
- Identify areas for applied research projects.

In conclusion, with a robust governance structure in place, the proposed Deemed-to-be University is positioned to operate with clarity, efficiency, and accountability. The roles and responsibilities outlined in this framework will guide the leadership in making impactful decisions, promoting transparency, and ensuring that the academic and operational goals are consistently met. By fostering a culture of collaborative governance, the aim is to build an institution that is resilient, adaptable, and unwavering in its commitment to excellence and student success. This structured approach to governance will be foundational to achieving the long-term vision and upholding the trust of the students, faculty, and stakeholders.

7.12 Plan for Financing Mechanism

This section outlines the diversified revenue streams, operational expenditures, and capital investment strategies that will enable the achievement of the academic and applied research goals. The proposed Deemed-to-be University "distinct category" will prioritize strategic investments in infrastructure, faculty, and student support services while maintaining a balanced financial structure that ensures fiscal prudence and resilience.

7.12.1 Sources of Funds

Fund Sources (INR Cr)	Year 1	Year 2	Year 3	Year 4	Year 5
Contribution from Promoter	**244.3**	**243.2**	**237.9**	**263.7**	**175.4**
Total	**244.3**	**243.2**	**237.9**	**263.7**	**175.4**
Capital Expenditure	**165.8**	**132.9**	**140.0**	**168.9**	**166.6**
Surplus of Income over expenditure (Deficit)	**78.5**	**110.3**	**98.0**	**94.8**	**8.8**
Total	**244.3**	**243.2**	**237.9**	**263.7**	**175.4**

Table 34 : 5 Year Plan for fund sources

7.12.2 Student Intake and Fees

Intake	Year 1	Year 2	Year 3	Year 4	Year 5	Year 10	Year 15
Masters Program	240	420	420	1,320	1,920	5,520	9,000
International Professional Technologists Program	100	100	100	150	150	300	300
Ph. D.	-	-	-	-	-	80	150
Total Students	340	520	520	1,470	2,070	5,900	9,450

Table 35 : 15 Year Plan for Student Intake

Fees (INR Lakhs)	Year 1	Year 2	Year 3	Year 4	Year 5	Year 10	Year 15
Master's Program (1st year)	12.0	12.0	12.6	12.6	13.2	14.6	16.1
Master's Program (2nd year)	3.0	3.0	3.2	3.2	3.3	3.6	4.0
International Professional Technologists Program	4.0	4.0	4.2	4.2	4.4	4.9	5.4

Table 36 : 15 Year Plan for fees per student

7.12.3 Fund requirement for capital expenditure (Values in INR Cr)

Expenditure for Infrastructure development	Year 1	Year 2	Year 3	Year 4	Year 5
Academic Block	16.2	17.0	17.8	18.7	19.7
Admin Area	6.8	7.2	7.5	7.9	8.3
Amenities Area	4.6	4.8	5.0	5.3	5.5
Access and Circulation Area	6.9	7.2	7.6	8.0	8.4
Recreation Area + Others	2.8	2.9	3.1	3.2	3.4
Accommodation Area	57.8	60.8	63.7	67.0	70.3
Lab Equipment	30.0	28.4	33.1	41.7	38.9
Digital Infra and Library	4.0	2.8	0.2	15.2	10.0
Other Capital Expenditure	11.7	1.8	1.9	2.0	2.1
Total fund requirement	**140.8**	**132.9**	**140.0**	**168.9**	**166.6**

Table 37 : 5 Year Plan for capital expenditure under infrastructure development

7.12.4 Projected Income and Expenditure Statement (Values in INR Cr)

Particulars	Year 1	Year 2	Year 3	Year 4	Year 5	Year 10	Year 15
Income							
Gross Fees Income	**32.8**	**61.6**	**70.4**	**185.9**	**304.3**	**988.2**	**1,801.1**
Less: Student Assistance	**22.2**	**32.2**	**28.6**	**53.0**	**54.1**	**87.8**	**152.8**

Particulars	Year 1	Year 2	Year 3	Year 4	Year 5	Year 10	Year 15
Net Fee Income	10.6	29.4	41.8	132.8	250.2	900.4	1,648.3
Other Income	1.3	1.3	1.4	5.4	9.0	47.0	84.9
Total Income	11.9	30.7	43.2	138.2	259.2	947.4	1,733.2
Expenses							
Staff Expenses	35.8	38.1	40.8	70.0	79.1	262.1	569.2
Academic expenses	9.0	34.4	15.4	32.4	25.7	76.6	127.8
Student Expenses	1.4	2.2	2.4	7.0	10.3	37.5	76.7
Administrative Expenses	27.8	37.9	45.0	58.8	71.5	230.1	360.6
Other Expenses	1.4	3.3	4.2	11.9	19.9	38.0	83.6
Total Expenses	75.4	115.9	107.8	180.1	206.6	644.4	1,218.0
Transfer to Depreciation Reserve	14.9	25.1	33.3	52.9	61.4	246.8	205.1
Surplus of Income over expenditure (Deficit)	-78.5	-110.3	-98.0	-94.8	-8.8	56.1	310.1
% on income	-660%	-360%	-227%	-69%	-3%	-5%	-8%
Appropriations							
Utilization for Capital Expenditure	-	-	-	-	-	56.1	34.2
Appropriation of funds* (Scholarship, Endowment Chair ,Building Development Research and Development)	-	-	-	-	-	-	207
Subtotal	-	-	-	-	-	56.1	241.2
Carried Forward as Free reserves	-78.5	-110.3	-98.0	-94.8	-8.8	-	68.9

Table 38 : 15 Year projected income and expenditure statement

In conclusion, the comprehensive financing mechanism provides a solid foundation for the successful launch and sustainable growth of the proposed Deemed-to-be University. With a balanced approach to funding sources, carefully projected income, and expenditure planning, it is positioned to meet both short-term needs and long-term objectives. This financial strategy will support not only academic programs and infrastructure development but also the commitment to student accessibility and quality education.

8. Five Year Rolling Implementation Plan

This section provides a phased approach to the proposed Deemed-to-be University's development, aligning short-term milestones with the long-term vision. Each year's plan is designed to build on the previous year's accomplishments, ensuring continuous progress in expanding academic programs, enhancing applied research capabilities, recruiting, and developing faculty, enriching the student experience, and building world-class infrastructure. This adaptive framework allows for regular assessment and adjustment, ensuring the proposed Deemed-to-be University remains responsive to evolving educational trends and emerging industry needs.

8.1 Overall Targets for 5 years

Parameter	Cumulative Targets				
	Year 1	Year 2	Year 3	Year 4	Year 5
Academics					
Number of schools	4	-	-	-	-
Total number of programs offered	10	12	12	15	15
Number of program offerings (Masters) offered	5	7	7	10	10
Number of iPTP programs offered	5	5	5	5	5
Faculty Plan					
Number of Professors	6	8	8	18	23
Number of Associate Professors	12	15	15	35	46
Number of Assistant Professors	16	21	21	52	69
Number of Adjunct Faculties	30	35	24	56	48
Student Plan					
Student enrolled in Masters	240	420	420	1,320	1,920
Infrastructure Plan (Area in Sq. Mts)					
Instructional area	2,837	5,674	8,511	11,348	14,185

Parameter	Cumulative Targets				
	Year 1	Year 2	Year 3	Year 4	Year 5
Admin Area	1,200	2,400	3,600	4,800	6,000
Amenities Area	800	1,600	2,400	3,200	4,000
Access and Circulation area	1,209	2,418	3,627	4,836	6,045
Recreational areas and others	487	974	1,461	1,948	2,435
Accommodation Area	11,960	23,920	35,880	47,840	59,800
Total Built Area	**18,493**	**36,986**	**55,479**	**73,972**	**92,465**

Table 39: Overall targets for 5 years

8.2 Readiness for launch of flagship programs

Before embarking on the journey of establishing the proposed Deemed-to-be University, a greenfield institution, there are several key preparations that need to be undertaken to ensure a successful launch and seamless operations in the first year. These essential steps are outlined in the table below.

Area	Action Plan
Formation of relevant authorities	Formation of the relevant authorities of the proposed Deemed-to-be University by recruitment of members, setting up policies/ guidelines for the following: • Executive Council • Academic Council • Finance Committee • Board of Studies • Selection Committee • Search-Cum-Selection Committee • International Advisory Board • Industry Advisory Board
Development of policies and guidelines	Development of the following policies, guidelines, and SoPs: • PoSH

Area	Action Plan
	• Student Admission • Faculty & Staff Recruitment • Diversity & Inclusion • Anti Ragging • Safety & crime prevention • Media & Outreach • Student wellness and health • Formation of student councils • Employee wellness and health • Promotion and Recognition • Career Development • Code of Conduct • Vendor onboarding • Partner onboarding • Procurement • Placement
Recruitment of staff	• Recruit faculty for each school as per UGC norms and internal recruitment policy • Recruit non-academic staff for functional departments such as finance, legal, digital, infrastructure, administration, wellness and health, student affairs, HR etc. • Recruit support staff such peons, office boys, sweepers, caretakers etc.
Readiness of Infrastructure (physical and digital)	• Check infrastructure readiness for the operationalization of 5 schools. • Check readiness of recreational and other facilities such as hostel, mess, canteen etc.
Onboarding of anchor academic and industry partners	• Finalize and onboard relevant academic and industry partners for the five schools.

Area	Action Plan
	• Finalize areas of engagement with partners
Set up of requisite state of the art Labs	• Set up requisite labs in collaboration with industry partners for the 5 schools that mimic the real world and simulate the student's hands on experience
Finalization of curriculum and syllabus	• The finalization of curriculum and syllabus based on the feedback from Board of Studies and the Academic Council. • Executive council will approve curriculum and syllabus for launch. • Create a detailed lecture plan for each program and map it with the respective teaching staff. • Develop a balanced and efficient assessment strategy that measures students' attainment of learning objectives. Incorporate varied types of assessment like formative, summative, peer, self, and project-based assessments. • Define KPIs for program success. • Prepare the academic calendar for the year
Getting approval from AICTE	• Study the AICTE approval process and focus on norms related infrastructure, faculty, program requirement etc. • Ensure compliance with AICTE norms and regulations - such as faculty to student ratio, library, laboratory, infrastructure, equipment, and other facilities which must meet prescribed guidelines. • Create an account on the AICTE portal for submitting application. • Prepare the requisite documents to be attached in the application. • Submit the application on the portal. • Coordinate with AICTE officials for inspection and site visit • Receive Letter of Approval (LOA) • Commence courses as per the approved curriculum. • Maintain adherence to AICTE norms

Area	Action Plan
Outreach for student admissions	• Define and finalize the eligibility and scholarship criteria for student enrollment according to guidelines. • Design and launch digital and offline marketing campaigns targeting the relevant demographics. • Conduct webinars, open houses, and campus tours to showcase the state-of-the-art infrastructure. • Develop program brochures, videos, and other collaterals for 5 flagship programs. • Set up of website with details of all 5 schools and their flagship programs, fees, governance structure etc.

Table 40: Readiness for launch of flagship programs

8.3 Year 1: Action Plan and Outcomes

Outcomes: Operationalization of 4 schools and respective flagship programs

Operationalization of flagship programs for year 1	
Processing of admissions	• Develop online admission portal on website with seamless application processing and tracking mechanism. • Open registrations for appearing in entrance examination. • Conduct entrance examination for the 5 flagship programs • Initiate enrollment on the website by rolling out the application form. • Set up helpline for admission related queries. • Provide provisional admission letters to selected students. • Train staff on handling the admission process efficiently
Provision of student support	• Conduct orientation of newly admitted students • Set up counselling and career guidance centers. • Launch student mentorship program with faculty • Facilitate formation of student clubs and committees such as student council, international affairs, event planning & coordination etc.

Operationalization of flagship programs for year 1	
	• Establish robust student management system for academic and non-academic support. • Develop feedback mechanisms. • Encourage student participation in hackathons, competitions, and social initiatives
Delivery of courses	• Monitor the implementation of modular and flipped classroom models. • Ensure timely availability of course materials and resources to students. • Conduct periodic faculty reviews to ensure alignment with learning outcomes. • Prepare problem statements for capstone projects in consultation with industry partners. • Allot the problem statement to students based on their interests
Management of academic calendar	• Ensure strict adherence to the academic calendar. • Schedule classes and lab for the students • Prepare schedule for the faculty
Monitoring of student performance	• Schedule regular faculty and student feedback sessions to identify issues if any. • Implement a mechanism for at risk students. • Conduct regular academic performance reviews in form of quizzes, internal assessments, and semester exams. • Provide remedial support to students wherever required. • Based on evaluations conducted, share the grade sheet with students
Conduct faculty development and mentorship programs	• Organize regular training sessions for faculty on innovative teaching methodologies in collaboration with partners. • Encourage participation in national and international conferences. • Establish peer review mechanisms to promote collaborative teaching improvements.

Operationalization of flagship programs for year 1	
	• Appoint the faculty as mentor for a group of 4-5 students to guide them during their 2-year program
Monitoring operational efficiency	• Continuously assess administrative processes for efficiency improvements • Automate routine processes like attendance, grading and communication wherever possible. • Ensure timely maintenance of industry scale labs and smart classrooms
Engagement with Industry and academia partners	• Organize regular industry interaction sessions, guest lectures etc. • Develop feedback loop with partners to adapt programs to evolving needs
Review of governance and policy	• Review and refine academic and administrative policies quarterly. • Establish grievance redressal mechanisms for students and staff. • Ensure adherence to UGC and other regulatory frameworks. • Prepare annual reports covering all aspects of the Deemed-to-be University
Management of institutional positioning	• Develop online presence through social media, PR campaigns and thought leadership articles. • Organize high visibility events like conferences, symposiums, and public events
Management of financials	• Monitor budget utilization for academic and infrastructure development. • Implement financial auditing and reporting systems to ensure transparency
Launch mental health and wellness programs	• Launch comprehensive wellness programs addressing mental, physical, and emotional health for staff and students. • Provide access to medical professionals
Placement of students in top companies	• Setting up of Placement Cell and the Student Placement Committee (SPC) consisting of at least 5 students

Operationalization of flagship programs for year 1	
	• Conduct relevant workshops, training, and soft skills development programs for interview preparation. • Organize industry talks, webinars, and guest lectures by experts from companies like Siemens, Micron, and ABB. • Collaborate with industry bodies like CII, NASSCOM, and FICCI for sector-specific guidance. • Conduct orientation sessions for students about job opportunities, career paths, and industry expectations. • Invite companies through formal letters and share detailed placement brochures. • Provide access to a dedicated online portal with student profiles and academic credentials. • Companies present job roles, salary packages, and career growth paths to students. • Allow students to clarify queries regarding job expectations. • Conduct multi-stage recruitment process. • Provide support to students on joining timelines and documentation. • Inform the students about their placement

Table 41: Operationalization of flagship programs for Year 1

Readiness for year 2	
Onboard of anchor industry and academic partners	• Finalize and onboard anchor industry and academic partners for two new flagship programs. • Finalize areas of engagement with the partners
Recruitment of faculty and staff	• Recruit and onboard faculty for the new flagship programs • Recruit additional staff as per requirements
Expansion of academic program specializations	• Design and finalize curriculum and syllabus for the two new flagship programs with industry and global academia inputs. • Prepare the academic calendar for the year. • Prepare lesson plans for the two new flagship programs

Readiness for year 2	
Extension of the infrastructure	• Scale up the infrastructure to accommodate the capacity increase due to introduction of new flagship programs and ramp up of existing flagship programs
Set up new labs	• If required, set up requisite labs in collaboration with industry partners aligned to the new program offerings that mimic the real world and simulate the student's hands on experience
Outreach for admissions	**For new students to be admitted in new and existing flagship programs:** • Define and finalize the eligibility and scholarship criteria for student enrollment according to guidelines. • Design and launch digital and offline marketing campaigns targeting the relevant demographics. • Conduct webinars, open houses, and campus tours to showcase the state-of-the-art infrastructure. • Develop program brochures, videos, and other collaterals. • Update website with details of two new flagship programs
Selection of academic pathways	**For students in year 2 of existing flagship programs:** • Set up process for selection of academic pathways for students to choose. • Assist and support the students to choose the right pathway for themselves

Table 42: Readiness for year 2

8.4 Year 2: Action Plan and Outcomes

Outcomes:

- Launch of two new additional flagship programs
- Scaling up of existing facilities and the flagship programs

Some of the activities mentioned under '*Table: Operationalization of flagship programs for year 1'* will be done annually as a part of the operationalization of programs and are considered a part of yearly action plan. These action items will not be included but are implied for year 2.

Operationalization of flagship programs for year 2	
Provide post placement support	• Conduct regular follow-up with recruiters to assess graduate performance and gain feedback. • Compile annual placement reports for internal review and external accreditation purposes.
Processing of admissions	• Open registrations and conduct entrance examination for- ✓ Batch 2 of existing 5 flagship programs ✓ Batch 1 of two new flagship programs • Provide provisional admission letters to new batches of selected students.
Provision of student support	• Conduct orientation of newly admitted students • Recruit new students in the existing student club. • Capture feedback from students and other relevant stakeholders
Delivery of courses	**For students in year 2 of existing flagship programs who have selected research pathway:** • Assist students to identify a specific research area aligned with their selected program offering and career aspirations. • Faculty to assist students to prepare a detailed synopsis and evaluate the synopsis. • Support and mentor the students to conduct their research, utilizing the proposed Deemed-to-be University's state-of-the-art labs and resources. • Faculty to evaluate the submitted thesis. **For students in year 1 across flagship programs:** • Prepare problem statements for capstone projects in consultation with industry partners. • Allot the problem statement to students based on their interests
Management of academic calendar	**For students in year 1 across flagship programs:** • Schedule classes and lab for the students • Prepare schedule for the faculty
Conduct faculty development and mentorship programs	**For students in year 1 across flagship programs:** • Appoint the faculty as mentor for a group of 4-5 students to guide them during their 2-year program
Management of institutional positioning	• Engage with ranking and accreditation agencies to build early visibility and credibility

Operationalization of flagship programs for year 2	
Placement of students in top companies	**For students in year 1 across new flagship programs:** • Recruit students in the Student Placement Committee (SPC) • Conduct relevant workshops, training, and soft skills development programs for interview preparation. • Organize industry talks, webinars, and guest lectures by experts from companies like Siemens, Micron, and ABB. • Conduct orientation sessions for students about job opportunities, career paths, and industry expectations. • Conduct the placement process as per the defined guidelines

Table 43 : Operationalization of flagship programs for year 2

Readiness for year 3	
Recruitment of faculty and staff	• Recruit and onboard additional faculty to increase the faculty student ratio to 1:10 • Recruit additional staff as per requirements
Strengthening and scaling up of academic program specializations	• Review the relevance and revise curriculum and syllabus for the 7 flagship programs with industry and global academia parts. • Prepare the academic calendar for the year
Extension of the infrastructure	• Expand the infrastructure as per business plan
Outreach for admissions	**For new students to be admitted across 7 flagship programs:** • Review the eligibility and scholarship criteria for student enrollment according to guidelines. • Design and launch digital and offline marketing campaigns targeting the relevant demographics. • Conduct webinars, open houses, and campus tours to showcase the state-of-the-art infrastructure. • Update program brochures, videos, and other collaterals
Selection of academic pathways	**For students in year 2 across flagship programs:** • Set up process for selection of academic pathways for students to choose. • Assist and support the students to choose the right pathway for themselves

Readiness for year 3	
Strengthening and reviewing existing systems and process	• Review and maintenance of digital infrastructure and laboratory equipment • Review and upgradation of policies if required. • Incorporate feedback received from stakeholders

Table 44 : Readiness for year 3

8.5 Year 3: Action Plan and Outcomes

Outcomes:

- Strengthening of the existing 7 flagship programs

Some of the activities mentioned under '*Table: Operationalization of flagship programs for year 1'* will be done annually as a part of the operationalization of programs and are considered a part of yearly action plan. These action items will not be included but are implied for year 3.

Operationalization of flagship programs for year 3	
Provide post placement support	**For students in year 2 across flagship programs:** • Conduct regular follow-up with recruiters to assess graduate performance and gain feedback. • Compile annual placement reports for internal review and external accreditation purposes.
Processing of admissions	• Open registrations and conduct entrance examination for new batches of 7 flagship programs • Provide provisional admission letters to new batches of selected students.
Provision of student support	• Conduct orientation of newly admitted students • Recruit new students in the existing student club. • Capture feedback from students and other relevant stakeholders
Delivery of courses	**For students in year 2 across flagship programs who have selected research pathway:** • Assist students to identify a specific research area aligned with their selected program offering and career aspirations. • Faculty to assist students to prepare a detailed synopsis and evaluate the synopsis.

<table>
<tr><th colspan="2">Operationalization of flagship programs for year 3</th></tr>
<tr><td></td><td>Support and mentor the students to conduct their research, utilizing the proposed Deemed-to-be University's state-of-the-art labs and resources.
Faculty to evaluate the submitted thesis.
For students in year 1 across flagship programs:
Prepare problem statements for capstone projects in consultation with industry partners.
Allot the problem statement to students based on their interests</td></tr>
<tr><td>Management of academic calendar</td><td>For students in year 1 across flagship programs:
Schedule classes and lab for the students
Prepare schedule for the faculty</td></tr>
<tr><td>Conduct faculty development and mentorship programs</td><td>For students in year 1 across flagship programs:
Appoint the faculty as mentor for a group of 4-5 students to guide them during their 2-year program</td></tr>
<tr><td>Management of institutional positioning</td><td>Start collating data in the template as per the NAAC guidelines.
Engage with ranking and accreditation agencies</td></tr>
<tr><td>Placement of students in top companies</td><td>For students in year 1 across flagship programs:
Recruit students in the Student Placement Committee (SPC)
Conduct relevant workshops, training, and soft skills development programs for interview preparation.
Organize industry talks, webinars, and guest lectures by experts from companies like Siemens, Micron, and ABB.
Conduct orientation sessions for students about job opportunities, career paths, and industry expectations.
Conduct the placement process as per the defined guidelines</td></tr>
<tr><td>Award of degree and convocation</td><td>For the students who have graduated in year 2:
Preparation of transcript and template of degree
Arrange convocation ceremony in campus for award of degree.
Arrange logistics to send degrees to the absentees</td></tr>
<tr><td>Engagement with Alumni</td><td>Establish Alumni Relations Office (ARO)
Recruit a dedicated team for the office.
Build a comprehensive alumni database</td></tr>
</table>

Table 45 : Operationalization of flagship programs for year 3

Readiness for year 4	
Onboard of anchor industry and academic partners	• Finalize and onboard anchor industry and academic partners for three new flagship programs. • Finalize areas of engagement with the partners
Recruitment of faculty and staff	• Recruit and onboard additional faculty for three new flagship programs • Recruit additional staff as per requirements
Introduction of new academic program specializations	• Development of curriculum and syllabus for three new flagship programs • Prepare lesson plans for the three new flagship programs. • Review the relevance and revise curriculum and syllabus for the existing 7 flagship programs with industry and global academia parts. • Prepare the academic calendar for the year
Extension of the infrastructure	• Expand the infrastructure to accommodate the increased capacity and student ramp up plan
Outreach for admissions	• Design and launch digital and offline marketing campaigns targeting the relevant demographics. • Conduct webinars, open houses, and campus tours to showcase the state-of-the-art infrastructure. **For new batches across flagship programs:** • Review the eligibility and scholarship criteria for student enrollment according to guidelines. • Update program brochures, videos, and other collaterals **For new batches of 3 new flagship programs:** • Define the eligibility and scholarship criteria for student enrollment according to guidelines. • Develop program brochures, videos, and other collaterals
Selection of academic pathways	**For students in year 2 across flagship programs:** • Set up process for selection of academic pathways for students to choose. • Assist and support the students to choose the right pathway for themselves
Strengthening and reviewing existing systems and process	• Review and maintenance of physical and digital infrastructure • Review and upgradation of policies if required. • Incorporate feedback received from stakeholders

Table 46 : Readiness for year 4

8.6 Year 4: Action Plan and Outcomes

Outcomes:

- Introduction of three new flagship programs
- Strengthening and scaling up of existing flagship programs

Some of the activities mentioned under '*Table: Operationalization of flagship programs for year 1'* will be done annually as a part of the operationalization of programs and are considered a part of yearly action plan. These action items will not be included but are implied for year 4.

Operationalization of flagship programs for year 4	
Provide post placement support	**For students in year 2 across flagship programs:** • Conduct regular follow-up with recruiters to assess graduate performance and gain feedback. • Compile annual placement reports for internal review and external accreditation purposes.
Processing of admissions	• Open registrations and conduct entrance examination for ✓ new batches of existing flagship programs ✓ three new flagship programs • Provide provisional admission letters to new batches of selected students.
Provision of student support	• Conduct orientation of newly admitted students • Recruit new students in the existing student club. • Capture feedback from students and other relevant stakeholders
Delivery of courses	**For students in year 2 across flagship programs who have selected research pathway:** • Assist students to identify a specific research area aligned with their selected program offering and career aspirations. • Faculty to assist students to prepare a detailed synopsis and evaluate the synopsis. • Support and mentor the students to conduct their research, utilizing the proposed Deemed-to-be University's state-of-the-art labs and resources. • Faculty to evaluate the submitted thesis. **For students in year 1 across flagship programs:** • Prepare problem statements for capstone projects in consultation with industry partners.

Operationalization of flagship programs for year 4	
	• Allot the problem statement to students based on their interests
Management of academic calendar	**For new batches across flagship programs:** • Schedule classes and lab for the students • Prepare schedule for the faculty
Conduct faculty development and mentorship programs	**For new batches across flagship programs:** • Appoint the faculty as mentor for a group of 4-5 students to guide them during their 2-year program
Management of institutional positioning	• Updating the collated data in the template as per the NAAC guidelines. • Understanding the guidelines of the NAAC application progress and preparing relevant reports • Engage with ranking and accreditation agencies
Placement of students in top companies	**For new batches across flagship programs:** • Recruit students in the Student Placement Committee (SPC) • Conduct relevant workshops, training, and soft skills development programs for interview preparation. • Organize industry talks, webinars, and guest lectures by experts from companies like Siemens, Micron, and ABB. • Conduct orientation sessions for students about job opportunities, career paths, and industry expectations. • Conduct the placement process as per the defined guidelines
Award of degree and convocation	**For students in year 2, across flagship programs:** • Preparation of transcript and template of degree • Arrange convocation ceremony in campus for award of degree. • Arrange logistics to send degrees to the absentees
Engagement with Alumni	• Utilize email, social media, and newsletters to keep alumni informed about updates on the proposed Deemed-to-be University. • Establish regional and interest-based alumni chapters. • Encourage alumni to connect with each other.

Table 47 : Operationalization of flagship programs for year 4

Readiness for year 5	
Recruitment of faculty and staff	• Recruit and onboard additional faculty to increase faculty student ratio to 1:14

Readiness for year 5	
	• Recruit additional staff as per requirements
Scaling up of existing academic programs	• Review the relevance and revise curriculum and syllabus for the existing 7 flagship programs with industry and global academia parts. • Prepare the academic calendar for the year
Extension of the infrastructure	• Expand the infrastructure to accommodate the increased capacity and student ramp up plan
Outreach for admissions	• Design and launch digital and offline marketing campaigns targeting the relevant demographics. • Conduct webinars, open houses, and campus tours to showcase the state-of-the-art infrastructure. **For new batches of existing flagship programs:** • Review the eligibility and scholarship criteria for student enrollment according to guidelines. • Update program brochures, videos, and other collaterals
Selection of academic pathways	**For students in year 2 across flagship programs:** • Set up process for selection of academic pathways for students to choose. • Assist and support the students to choose the right pathway for themselves
Strengthening and reviewing existing systems and process	• Review and maintenance of digital infrastructure and laboratory equipment • Review and upgradation of policies if required. • Incorporate feedback received from stakeholders

Table 48 : Readiness for year 5

8.7 Year 5: Action Plan and Outcomes

Outcomes:

- Strengthening and scaling up of existing flagship programs

Some of the activities mentioned under '*Table: Operationalization of flagship programs for year 1'* will be done annually as a part of the operationalization of programs and are considered a part of yearly action plan. These action items will not be included but are implied for year 5.

Operationalization of flagship programs for year 5	
Provide post placement support	**For existing students in year 2 across flagship programs:** • Conduct regular follow-up with recruiters to assess graduate performance and gain feedback. • Compile annual placement reports for internal review and external accreditation purposes.
Processing of admissions	• Open registrations and conduct entrance examination for new batches of existing flagship programs • Provide provisional admission letters to new batches of selected students.
Provision of student support	• Conduct orientation of newly admitted students • Recruit new students in the existing student club. • Capture feedback from students and other relevant stakeholders
Delivery of courses	**For existing students in year 2 across flagship programs who have selected research pathway:** • Assist students to identify a specific research area aligned with their selected program offering and career aspirations. • Faculty to assist students to prepare a detailed synopsis and evaluate the synopsis. • Support and mentor the students to conduct their research, utilizing the proposed Deemed-to-be University's state-of-the-art labs and resources. • Faculty to evaluate the submitted thesis. **For batches of new students across flagship programs:** • Prepare problem statements for capstone projects in consultation with industry partners. • Allot the problem statement to students based on their interests
Management of academic calendar	**For new batches across flagship programs:** • Schedule classes and lab for the students • Prepare schedule for the faculty
Conduct faculty development and mentorship programs	**For new batches across flagship programs:** • Appoint the faculty as mentor for a group of 4-5 students to guide them during their 2-year program
Management of institutional positioning	• Preparation and submission of NAAC application • Liaison with NAAC officials

<table>
<tr><th colspan="2">Operationalization of flagship programs for year 5</th></tr>
<tr><td>Placement of students in top companies</td><td>For new batches across flagship programs:
• Recruit students in the Student Placement Committee (SPC)
• Conduct relevant workshops, training, and soft skills development programs for interview preparation.
• Organize industry talks, webinars, and guest lectures by experts from companies like Siemens, Micron, and ABB.
• Conduct orientation sessions for students about job opportunities, career paths, and industry expectations.
• Conduct the placement process as per the defined guidelines</td></tr>
<tr><td>Award of degree and convocation</td><td>For students in year 2, across flagship programs:
• Preparation of transcript and template of degree
• Arrange convocation ceremony in campus for award of degree.
• Arrange logistics to send degrees to the absentees</td></tr>
<tr><td>Engagement with Alumni</td><td>• Utilize email, social media, and newsletters to keep alumni informed about updates on the proposed Deemed-to-be University.
• Establish regional and interest-based alumni chapters.
• Encourage alumni to connect with each other.
• Organize events such as homecoming, networking nights, and guest lectures.
• Foster a sense of community among graduates.</td></tr>
</table>

Table 49 : Operationalization of flagship programs for year 5

In conclusion, the five-year rolling implementation plan serves as a dynamic and strategic blueprint for the proposed Deemed-to-be University's growth, ensuring that every side of the development is well-coordinated and aligned with the mission. By following this phased approach, it can systematically expand the academic and research offerings, attract top-tier faculty, enhance the student experience, and build robust infrastructure. This initiative-taking and adaptable plan will be the guide for the proposed Deemed-to-be University in achieving academic excellence and operational efficiency, positioning it as a leader in higher education.

9. Annexure

9.1 Institutes providing a residential PG program in similar disciplines.

Discipline	Institute Name	Program Name	Duration	Student Intake
Smart Manufacturing	IISc Bangalore	M. Tech in Smart Manufacturing	Two-year	10
	IIITDM Jabalpur	M. Tech in Smart Manufacturing	Two-year	10
	IIT Jodhpur	M. Tech in Advanced Manufacturing and Design	Two-year	12
	NIT Jamshedpur	M. Tech in Smart Manufacturing	Two-year	15
	IIIT DM Kurnool	M. Tech in Smart Manufacturing	Two-year	15
	NIT Bhopal	M. Tech in Smart Manufacturing	Two-year	20
Semiconductor	IISc Bangalore along with 4 Taiwan Universities	Joint M. Tech in Semiconductor Technology	Two-year	8
	IISc Bangalore	M.E. in Semiconductor Technology	One-year	20
Sustainability	NIT Tiruchirappalli	M. Tech Energy Efficient & Sustainable Architecture	Two-year	25
	NIT Warangal	M. Tech in Sustainable Energy Generation and Storage Technologies	Two-year	20
	NIT Puducherry	M. Tech Structural Engineering - Resilience and Sustainability	Two-year	10
	NIT Hamirpur	Sustainable Architecture	Two-year	19
	Central University of Rajasthan	Sustainable Architecture	Two-year	12
	TERI School of Advanced Studies	M.Sc. in Environmental Studies and Resource Management	Two-year	50
	IIT Madras	M. Tech Environmental Science & Engineering	Two-year	10
	IIT Hyderabad	M. Tech Energy Science and Technology	Two-year	15
Robotics	NIT Bhopal	M. Tech Automation and Robotics	Two-year	5
	IIIT DM Kurnool	M. Tech Robotics and Automation	Two-year	20
	IIIT Allahabad	M. Tech IT with specialization in Machine Learning, Robotics and Human-Computer Interaction Group	Two-year	48

Discipline	Institute Name	Program Name	Duration	Student Intake
	Guru Ghasidas Vishwavidyalaya	M. Tech in CAD/CAM-ROBOTICS	Two-year	18
	IIT Madras	Interdisciplinary Dual Degree program in Robotics	Five-year	25

Table 50 : Institutes providing a residential PG program in similar disciplines.

9.2 Academic Collaborations

NAMTECH has established a robust network of global academic partners, strategically designed to amplify the learning experience in alignment with its core strengths. These partnerships are set to bring unparalleled credibility to NAMTECH, leveraging the extensive expertise and innovative advancements of these esteemed institutions.

A key example is the collaboration with TUM Asia, Singapore with whom the flagship iPMP in Smart Manufacturing has been successfully developed and delivered. Currently, NAMTECH is in advanced discussions with prestigious institutions such as the Massachusetts Institute of Technology (MIT), Carnegie Mellon University (CMU), Stanford Doerr Institute for Sustainability, Colorado School of Mines, Washington University in St. Louis, Purdue University Northwest, IIT Roorkee, IIT Gandhinagar, and LMNIIT Jaipur. These collaborations aim to design, develop, and deliver cutting-edge programs, supported by state-of-the-art laboratories and an experiential learning ecosystem, providing students with enriched learning opportunities and exceptional outcomes. Below are highlights of some of the key partnerships.

1. **Partnership with Purdue University Northwest (PNW)**

PNW is a public university with campuses in Hammond and Westville, Indiana, USA. It offers a blend of academic excellence and real-world experience, with over 70 degree programs ranging from cybersecurity to psychology.

Aligning to NAMTECH's vision of building hands-on skills and an industry-focused program, NAMTECH and PNW have agreed to design a "1+1" academic pathway for NAMTECH students. PNW will be admitting students who have successfully completed the one-year iPMP in Smart Manufacturing at NAMTECH to a second year of Master of Science in Mechanical Engineering at PNW provided they meet or exceed the requirements for admission to the graduate programs at PNW, including the requirements for English proficiency. This marks one of a kind partnership as the university offers an academic pathway towards a Master of Science degree to students studying under a non-academic program. Additionally, moving forward PNW will also help NAMTECH to design their own Master of Science in Mechanical Engineering program.

WITNESSETH THAT:

Scope of Agreement

This agreement will establish a relationship between New Age Makers Institute of Technology (NAMTECH), an educational institute founded by New Age Education and Skills Foundation, a company incorporated under Section 8 of the Companies Act, 2013 with its registered office atAM/NS House, AM/NS Township, 27km, Surat – Hazira Road, Hazira, Surat 394270, India and Purdue University Northwest (PNW), Hammond, IN to assist NAMTECH students in fulfilling the requirements for admission into the graduate programs at PNW.

2. Partnership with Technical University of Munich, Asia

Technical University of Munich (TUM) was founded in 1868 and is ranked as Germany's #1 University, also a known leading technical university in Europe. TUM has strived to create sustainable solutions for society through excellence in education and research. TUM Asia was set up in 2002 as the first academic branch campus of any German university. Additionally, TUM Asia now offers a new suite of Executive Education courses in areas such as Industry 4.0 and Precision Engineering. TUM Asia has partnered with leading didactic and solution partner Festo to develop education activities, for students and employees interested in upskilling themselves in the areas of Automation Technology and Industry 4.0 (Industry 4.0) in Singapore.

TUM's dedication towards Industry 4.0 technologies has led TUM Asia to become an anchor academic partner for the NAMTECH iPMP in Smart Manufacturing Program. TUM Asia has significantly contributed to various aspects of the program. The areas of collaboration are as follows:

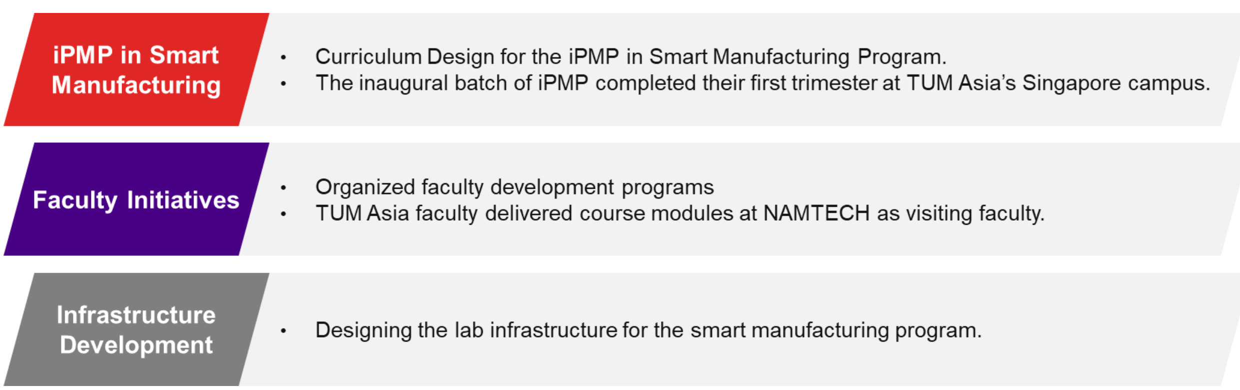

Figure 50 : Areas of partnership with TUM Asia

This second amendment of the **Agreement for Curriculum/Content Development For New Age Makers Institute of Technology (NAMTECH) an educational initiative of ArcelorMittal Nippon Steel India Limited** dated June 30, 2023 and its first amendment dated August 09, 2023 (together as "**Agreement**") is made and entered at [●] on this day of , 2023 ("**Second Amendment**") by and between

(1) **ARCELORMITTAL NIPPON STEEL INDIA LIMITED**, a company incorporated under the provisions of (Indian) Companies Act, 1956 and having its CIN U27100GJ1976FLC013787 and registered office at AMNS House, AMNS Township, 27th KM, Surat Hazira Road, Hazira, Surat – 394 270, Gujarat, India, represented by its duly authorized representative designated on the signature page of this First Amendment (hereinafter referred to as "**AMNS**" or "**ArcelorMittal Nippon Steel India**")

AND

(2) **GERMAN INSTITUTE OF SCIENCE AND TECHNOLOGY - TUM ASIA PTE. LTD.** (Company Registration No.: 200105229R), a company incorporated in Singapore and having its place of business at 510 Dover Road, SIT@SP Building #05-01, Singapore 139660 ("**TUM Asia**");

3. Partnership with ITEES Singapore

Institute of Technical Education, (ITE) Singapore is a model postsecondary education institute in Singapore. It has over the years, gained a reputation as one of the TVET institutions in the region. In 2015, Indian Prime Minister, Mr. Narendra Modi visited the ITE Singapore campus, accompanied by the Singapore Prime Minister, Mr. Lee Hsien Loong. Mr. Modi was impressed with the institution and since then the PMO has pushed the case for Indian institutions to partner with ITE to establish "ITE" like institutions in India.[33]

ITE Singapore has a consulting arm ITE Education Services (ITEES), that supports other countries to establish vocational education institutions on the ITE model. ITEES has worked with/ is currently working with 5 State Governments in India – Odisha, Madhya Pradesh, Delhi, Assam & Rajasthan. Of this, the Odisha, Madhya Pradesh, and Assam projects are supported by funding from Asian Development Bank (ADB).

In the initial conceptualization of NAMTECH, ITE Singapore was projected as a role model institution for it. Accordingly, a partnership conversation was initiated with ITEES leadership. In Dec 2022, an agreement was signed stating the below collaboration areas:

[33] Ministry of Foreign Affairs Singapore - MFA Press Statement: Official Visit of Prime Minister of the Republic of India Narendra Modi to Singapore, 23 to 24 November 2015

Figure 51 : Areas of partnership with ITEES Singapore

Introduction

1 This Memorandum of Understanding (MOU) is made between:

1.1 New Age Education and Skills Foundation a subsidiary of ArcelorMittal Nippon Steel India Limited (NAESF) (established under Section 8 of the Companies Act, 2013), having its registered address at 'AMNS HOUSE,' AMNS Township, Surat, Gujarat, India and has established an institute named New Age Makers Institute of Technology ("NAMTECH")."

1.2 ITE Education Services (ITEES), Singapore, and having its principal place of business at ITE Headquarters, 2 Ang Mo Kio Drive, Singapore 567720.

4. Partnership with Massachusetts Institute of Technology (MIT)

MIT is globally #1 ranked university for the past 12 years. NAMTECH has collaborated with MIT for a one-year "pilot" engagement that would layout a foundation for the School of Manufacturing Design and AI.

The details of the areas of partnership are as follows:

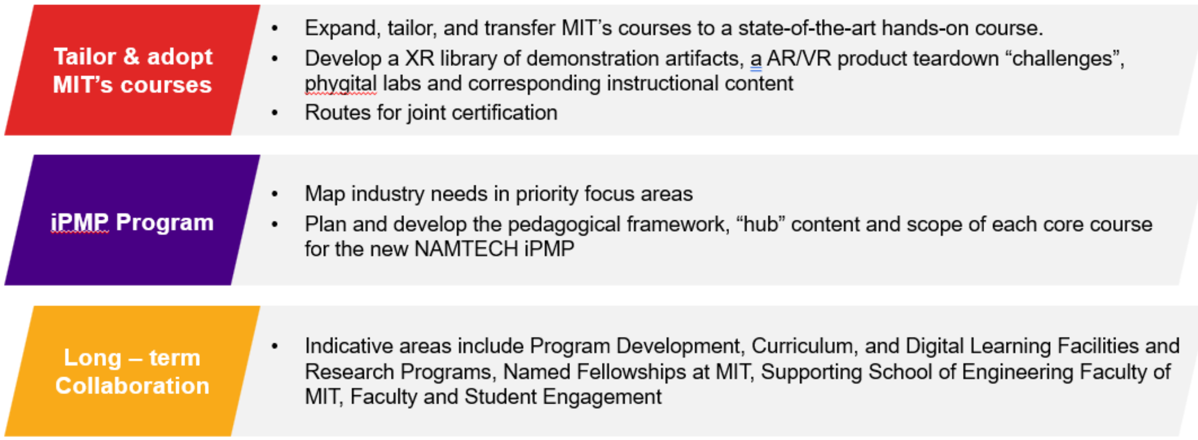

Figure 52 : Areas of partnership with MIT

As a part of the collaboration, NAMTECH and MIT will adopt best practices from MIT's courses like hands-on projects and assignments. These could include designing and building parts, analyzing manufacturing processes, and working on enhancing their problem-solving abilities within the context of manufacturing. Ultimately, the aim of this course is to equip students with strong design and manufacturing skills, preparing them for real-world engineering challenges.

5. **Partnership with Carnegie Mellon University (CMU)**

Carnegie Mellon University is a private research university in Pittsburgh, Pennsylvania originally established in 1900 stands among the world's most renowned educational institutions. Carnegie Mellon is known for its advances in research and new fields of study, notably being home to many firsts in computer science and pioneering the field of management science.

Carnegie Mellon University

The details for the areas of collaboration are as below:

Figure 53 : Areas of partnership with CMU

NAMTECH has collaborated with CMU for its social outreach and learning engineering initiatives. For this purpose, NAMTECH is working closely with the CMU Simon Initiative. The Simon Initiative at CMU is dedicated to improving student learning outcomes through the application of learning science and technology. Named after Nobel laureate Herbert A. Simon, the initiative leverages decades of research in cognitive science, computer engineering, and human-computer interaction. By integrating these innovative approaches, the Simon Initiative aims to create more effective and personalized learning experiences for students. Further, as a part of the collaboration NAMTECH has gained access to CMU's Open Learning Initiative (OLI) platform which is an online learning platform designed using a scientific approach to learning, with a focus on student engagement and interactive learning. NAMTECH will leverage this platform for providing courses and to support research by collecting data on student interactions and using this to continually improve the courses and their design.

Education and Training Agreement

This Education and Training Agreement ("**Agreement**") is made and entered into this 13th day of September 2024, to be effective as of January 1, 2024 ("**Effective Date**"), by and between Carnegie Mellon University, a Pennsylvania nonprofit corporation with a principal place of business located at 5000 Forbes Avenue, Pittsburgh, PA 15213 USA ("**Carnegie Mellon**") and New Age Education and Skills Foundation, a company established under Section 8 of Companies Act, 2013 (India) that has founded New Age Makers Institute of Technology (NAMTECH), with a principal place of business located at AMNS House, AMNS Township, 27TH KM, Surat-Hazira Road, Hazira, Surat, Gujarat India– 394270 ("**Company**").

6. **Partnership with IIT Roorkee**

IIT Roorkee will be helping NAMTECH in launch of modular one-year professional master's programs, micro-masters, management development, and masterclass programs focused on sustainable energy, and circularity. In addition, IIT Roorkee has also agreed to set up Demonstration Labs for sustainable grids, energy management, building automation, water assessment, and hydrogen production and storage aiding the Living Labs at NAMTECH.

THIS Memorandum of Understanding (hereinafter referred to as the "MOU") is made on this 25th day of October, Two Thousand and Twenty-Four (2024) and entered into:

By and between

Indian Institute of Technology, Roorkee, a statutory body constituted under the Indian Institute of Technology Act, 1961, functioning at its premises at Roorkee-Haridwar Highway, Roorkee, Uttarakhand 247667 (hereinafter referred to as the "IITR" which expression shall, unless repugnant to the context or meaning thereof, include its successors, permitted assigns, group entities, affiliates, subsidiaries, and associated entities).

New Age Education and Skills Foundation, a not-for-profit company established under Section 8 of the Companies Act, 2013 by ArcelorMittal Nippon Steel India Limited, having its registered office at AMNS House, AMNS Township, 27km, Surat- Hazira Road, Hazira, Surat 394270, India, and has founded an educational institute named New Age Makers Institute of Technology (hereinafter referred to as "NAMTECH" which expression shall, unless repugnant to the context or meaning thereof, include its successors, permitted assigns, group entities, affiliates, subsidiaries, and associated entities)

7. **Partnership with the National Taipei University of Technology, Taiwan**

Taipei Tech has collaborated with NAMTECH to develop cooperation and academic exchange in education and research between the two educational institutions. The two institutes will carry out joint research activities, faculty and student exchange programs, knowledge sharing, joint course development and implementation at NAMTECH, and guidance for establishing a Research and Training Development center at NAMTECH.

MEMORANDUM OF UNDERSTANDING
between
New Age Education and Skills Foundations (NAMTECH), India
and
College of Engineering,
National Taipei University of Technology, Taiwan

8. Partnership with IIT Gandhinagar

NAMTECH transitory campus has been set up in IIT Gandhinagar Research Park with an area of approximately 1,00,000 sq ft.

Novation Agreement

This Novation Agreement (the "**Agreement**") is entered into on 01st day of March 2024 at Gandhinagar, Gujarat, amongst

IIT Gandhinagar Research Park, a company registered under Section 8 of the Companies Act, 2013 (CIN Number: U73100GJ2017NPL095332) and promoted by Indian Institute of Technology Gandhinagar having its registered office at Academic Block No.3, Indian Institute of Technology Campus at Palaj, Gandhinagar, Gujarat represented by its Director (hereinafter referred to as the "**IITGNRP**") (which term shall mean and include wherever the context so requires or admits his heirs, successors, administrators, executors, attorneys and assigns).

And

New Age Education and Skills Foundation, a not for profit company established under Section 8 of Companies Act, 2013 (CIN Number: U80902GJ2023NPL138476)by ArcelorMittal Nippon Steel India Limited having its registered office at AMNS House, AMNS Township, 27km, Surat- Hazira Road, Hazira, Surat 394270, India. (hereinafter referred to, as the "**NAESF**"/ "**Transferee**") (which term shall mean and include wherever the context so admits or requires its successors, administrators and assigns). NAESF has founded an educational institute named New Age Makers Institute of Technology (NAMTECH).

9. Partnership with LNM Institute of Information Technology (LNMIIT), Jaipur

LNMIIT Jaipur and NAMTECH have collaborated on areas such as offering mentorship for the integration of best practices in engineering education, curriculum design, creating user-friendly online resources, pursuing projects jointly, establishing academic pathways, and collaborating on research and innovation.

Memorandum of Understanding

Between

1. ArcelorMittal Ventures India Private Limited, a private limited company incorporated under the provisions of the (Indian) Companies Act, 2013 and having its registered office at Unit No. DTJ - 108, First Floor, Plot No. 11 DLF Tower B, Jasola New Delhi New Delhi 110025 India (hereinafter referred to as "**ArcelorMittal India**"); and

2. The Board of Trustees of the LNM Institute of Information Technology, for and on behalf of the LNM Institute of Information Technology, Jaipur, India ("**LNMIIT**").

9.3 Industry Collaborations

NAMTECH has developed an impressive network of both global and Indian industry collaborations, strategically designed to advance key areas such as infrastructure development, the creation of state-of-the-art laboratories, program development and delivery, recruitment and training initiatives, outreach efforts, and scholarship funding.

The proposed Deemed-to-be University has successfully secured partnerships with leading corporations such as ASDC, FESTO, Schneider, Micron, Cisco, Fanuc, and ICICI all of which are dedicated to supporting NAMTECH's mission. These collaborations highlight NAMTECH's unwavering commitment to academic excellence and infrastructure growth, providing students with exceptional resources and opportunities that prepare them to become future-ready professionals. Below are the details about the collaboration with a few partners:

1. Partnership with FESTO

NAMTECH has established a constructive partnership with Festo, known globally for being a leading, advanced supplier of automation technology. Festo is a strategic partner for lab equipment supply and curriculum development at NAMTECH.

NAMTECH has worked closely with Festo's training and development team, envisaging to expose students to forefront Industry 4.0 technology. This symbiotic collaboration not only boosts NAMTECH's academic offerings but also equips students with pragmatic skills, knowledge that are of high relevance in the prevailing manufacturing sector, and industry-aligned academic experiences.

Our partnership with Festo has been fruitful in numerous ways including:

- The delivery of iPMP Smart Manufacturing curriculum by experienced industry experts from Festo on the NAMTECH campus.
- Joint development of lab infrastructure, catered specifically for the iPMP Smart Manufacturing program.
- One notable innovative result of our collaboration is the design of mobile lab infrastructure, or "Lab on Wheels" used for various outreach programs, symbolizing our shared dedication to expanding educational potential beyond the traditional setting.

Figure 54 : NAMTECH Labs on Wheels

Memorandum of Understanding

Between

1. **Arcelor Mittal Nippon Steel India Limited**, a public limited company incorporated under the provisions of the (Indian) Companies Act, 1956 and having its registered office address at AMNS House, AMNS Township, 27th KM, Surat Hazira Road, Surat, Gujarat, India (hereinafter referred to as "**AMNS India**" which expression shall, unless repugnant to the context, includes its successors and permitted assigns) OF THE FIRST PART,

AND

2. **Festo India Private Limited**, a private limited company incorporated under the provisions of the (Indian) Companies Act, 1956 and having its office at Festo India Private Limited, 237 B , Bommasandra Industrial Area, Hosur Road, Bengaluru 560099 India (hereinafter referred to as "**Festo**") which expression shall, unless repugnant to the context, includes its successors and permitted assigns) of the SECOND PART,

2. Partnership with Schneider Electric

NAMTECH has entered a strategic alliance with Schneider Electric, a leading provider of energy management and automation solutions. The partnership aims to forge a state-of-the-art smart campus and training laboratories. The partnership offers significant advantages to our students including access to industry experts, skills exposure, and potential employment openings in both local and international markets.

A central focus of our collaboration with Schneider Electric involves:

- The design and delivery of the International Professional Master's Program (iPMP) in Smart Manufacturing ensuring a curriculum that is industry-aligned and offers opportunities for hands-on experience.
- Transforming the new campus into a living lab, setting fresh industry standards in sustainability and responsible living.
- Schneider has also been instrumental for setting up of labs for the School of Manufacturing Technologies
- In the School of Social Impact, the collaboration has fostered faculty training initiatives and the implementation of a "Lab-on-wheels" augmenting the interactive educational experience.

Memorandum of Understanding

This MEMORENDUM OF UNDERSTANDING(MOU) is signed on this 1st day of June 2023 between

1. **Arcelor Mittal Nippon Steel India Limited**, a public limited company incorporated under the provisions of the (Indian) Companies Act, 1956 and having its registered office address at AMNS House, AMNS Township, 27th KM, Surat Hazira Road, Surat, Gujarat, India (hereinafter referred to as "**AMNS India**" which expression shall, unless repugnant to the context, includes its successors and permitted assigns) OF THE FIRST PART,

AND

2. **Schneider Electric India Private Limited** is a private limited company incorporated under the provisions of the (Indian) Companies Act, 1956 and having its registered office at C-56, Mayapuri Industrial Area, Phase-II New Delhi, 110064 (hereinafter referred to as "**SEIPL / Schneider Electric**") which expression shall, unless repugnant to the context, includes its successors and permitted assigns) of the SECOND PART,

3. Partnership with Micron

Micron is leading the semiconductor manufacturing foray in India and establishing a state-of-the-art facility in Sanand, which lies in close proximity to our campus.

NAMTECH and Micron have collaborated towards building a world-class Semiconductor Manufacturing Center by harnessing the strengths of Micron and its upcoming facility.

The partnership seeks to provide students with hands-on experience, exposure to top-notch infrastructure, and career advancement opportunities.

So far, we are jointly advancing on our 5-year vision that includes the design and launch of a 1-year iPMP in Semiconductor Manufacturing, bolstered by lab infrastructure featuring industry-grade equipment from Micron. Additionally, we've witnessed the encouraging placement of seven students from the first iPMP batch in Smart Manufacturing, signaling the positive impact of this strategic partnership.

MEMORANDUM OF UNDERSTANDING

This Memorandum of Understanding ("**MOU**") is entered into as of the last date of signature below and sets forth certain non-binding understandings between Micron Semiconductor Technology India Private Limited (**"Micron"**), and New Age Education and Skills Foundation, a Section 8 not-for-profit company as a promoter of New Age Makers Institute of Technology (**"NAMTECH"**). Micron and NAMTECH may be referred to herein individually as a "**Party**" and collectively as the **"Parties."**

4. Partnership with ICICI Bank

NAMTECH has the privilege of partnering with ICICI Bank, one of India's leading private sector banks well-known for its diversified financial services. ICICI Bank has a comprehensive portfolio, covering everything from retail banking to project and corporate finance.

ICICI Bank has committed to this collaboration for the next five years, with a pilot project slated to kick off in August '24. These strategic achievements form a template for NAMTECH to follow when approaching other CSR donors.

One key facet of this partnership involves the bank's significant contributions to NAMTECH's Outreach Program under the NAMTECH School of Social Impact (NSSI). ICICI has provided INR 35 Cr of funding to NAMTECH for infrastructure development for the NAMTECH outreach program. Utilizing this amount NAMTECH has developed lab & civil infrastructure across 5 ITIs in Gujarat.

Automation Technician Lab - ITI Mehsana


Digital Lab - ITI Vadnagar


Precision Manufacturing Lab - ITI Visnagar


Advanced Welding Lab - ITI Kheralu


Digital Lab - ITI Visnagar


Electrician Lab - ITI Siddhpur

LETTER OF INTENT ("LOI")

February 08, 2024

New Age Makers Institute of Technology (NAMTECH),
AMNS House, AMNS Township, 27km, Surat- Hazira Road, Hazira, Surat 394270, India

Kind Attn: Arunkumar Pillai, Director General, NAMTECH

Dear Sir,

Sub: Collaboration towards NAMTECH School for Social Impact ("NSSI")

ICICI Foundation for Inclusive Growth is a public charitable trust which operates in the areas of skill development and sustainable livelihoods for the less privileged, environment conservation, financial inclusion, healthcare and other social projects across rural and urban areas of the country (hereinafter referred to as "ICICI Foundation").

New Age Makers Institute of Technology is an educational institute, having its registered office at AMNS House, AMNS Township, 27km, Surat- Hazira Road, Hazira, Surat 394270, India (hereinafter referred to as the "NAMTECH" which expression shall unless repugnant to the context or meaning thereof, include its successors and permitted assigns), founded by New Age Education and Skills Foundation (NSSI), a not for profit company established under Section 8 of Companies Act, 2013 by ArcelorMittal Nippon Steel India Limited.

5. Partnership with ABB Robotics

NAMTECH and ABB Robotics have collaborated to establish a pioneering School of Robotics in India. Together the aim is to create an innovative educational framework to advance robotics education and industry integration in India, addressing the growing demand for skilled professionals in this vital field.

The School of Robotics will feature a comprehensive curriculum developed through global academic partnerships and will offer experiential, industry-aligned programs. With ABB Robotics as the strategic industry partner, NAMTECH aims to harness its extensive expertise and global ecosystem of innovation to nurture talent, promote knowledge sharing, and create enhanced research opportunities.

MEMORANDUM OF UNDERSTANDING

This Memorandum of Understanding is signed on the last date of signatures below ("Effective Date")

BY AND BETWEEN

New Age Education and Skills Foundation a subsidiary of ArcelorMittal Nippon Steel India Limited (established under Section 8 of the Companies Act, 2013), having its registered address at 'AMNS HOUSE,' AMNS Township, Surat, Gujarat, India and has established an educational institute named New Age Makers Institute of Technology (hereinafter referred to as "NAMTECH")

And

ABB India Ltd having its registered office at "Disha – 3rd Floor, Plot No. 5 & 6, 2nd Stage, Peenya Industrial Area IV, Peenya, Bengaluru - 560 058" (hereinafter referred to as "ABB")

6. Partnership with ASDC – Automotive Skills Development Council

ASDC is helping NAMTECH with the establishment of competency centers, academic program development, assessment along faculty identification and development. Further, ASDC will be providing equipment assistance including procurement, accreditation, and quality assurance.

COLLABORATION AGREEMENT

THIS collaboration agreement (the "**Agreement**") is made on ____________ 2023 by and between:

ArcelorMittal Nippon Steel India Limited, a public limited company incorporated under the provisions of the (Indian) Companies Act, 1956 and having its registered office address at AMNS House, AMNS Township, 27th KM, Surat Hazira Road, Surat, Gujarat, India (hereinafter referred to as "**AMNS India**" which expression shall, unless repugnant to the context, includes its successors and permitted assigns) OF THE FIRST PART,

AND

Automotive Skills Development Council having its corporate office at 153, GF, Okhla Industrial Area, Phase 3, New Delhi 110020 (India), (hereinafter referred to as "**ASDC**" which expression shall, unless repugnant to the context, includes its successors and permitted assigns) of the SECOND PART,

7. Partnership with Siemens

Siemens has agreed to partner with NAMTECH for education, training, and workforce development programs. Together NAMTECH and Siemens will launch elective courses under iPMP and iPTP programs in areas of smart manufacturing, and automation, and develop training infrastructure.

MEMORANDUM OF UNDERSTANDING

This non-binding Memorandum of Understanding ("MOU") is signed on the last date of signatures below ("Effective Date")

BY AND BETWEEN

New Age Education and Skills Foundation a subsidiary of ArcelorMittal Nippon Steel India Limited (established under Section 8 of the Companies Act, 2013), having its registered address at 'AMNS HOUSE,' AMNS Township, Surat, Gujarat, India and has established an educational institute named New Age Makers Institute of Technology (hereinafter referred to as "NAMTECH")

And

Siemens Limited having its registered office at Birla Aurora, Level 21, Plot No. 1080, Dr. Annie Besant Road, Worli, Mumbai – 400030 (hereinafter referred to as "Siemens")

8. Partnership with Cisco

Cisco has collaborated with NAMTECH in the areas of Skill Development, IT Education, and Government Workforce Development Programs. As a part of this collaboration, NAMTECH will launch elective courses and dedicated iPMP programs in cybersecurity and networking. Further, Cisco will provide NAMTECH students with experiential learning opportunities in the form of internship and industry relevant trainings.

MEMORANDUM OF UNDERSTANDING

This Memorandum of Understanding is signed on the last date of signatures below ("Effective Date") by and between:

New Age Education and Skills Foundation a subsidiary of ArcelorMittal Nippon Steel India Limited (established under Section 8 of the Companies Act, 2013), having its registered address at 'AMNS HOUSE,' AMNS Township, Surat, Gujarat, India and has established an institute named New Age Makers Institute of Technology (hereinafter referred to as "NAMTECH")

And

Cisco Commerce India Pvt. Ltd. having its registered office at Brigade South Parade, 2nd Floor, No. 10, Mahatma Gandhi Road, Bengaluru, Karnataka 560001 (hereinafter called "Cisco"), and the global headquarters of its parent company, Cisco Systems, Inc., located at San Jose, California, USA.

9. Partnership with FANUC

FANUC has collaborated with NAMTECH. Some of the areas of collaboration include enhancing educational opportunities and the broader development of technical talent in NAMTECH and in India, developing training infrastructure and equipment at the NAMTECH, supporting and facilitating continuous learning, developing of curriculum and online content, and jointly working with various State Govt. to create centers of Excellence for Robotics and Precision Engineering.

MEMORANDUM OF UNDERSTANDING

This Memorandum of Understanding is signed on the last date of signatures below ("Effective Date") by and between:

New Age Education and Skills Foundation a subsidiary of ArcelorMittal Nippon Steel India Limited (established under Section 8 of the Companies Act, 2013), having its registered address at 'AMNS HOUSE,' AMNS Township, Surat, Gujarat, India and has established an institute named New Age Makers Institute of Technology (hereinafter referred to as "NAMTECH")

And

FANUC India Private Limited having its registered office at No. 41A, Electronics City, Bangalore-560100 (hereinafter called "FANUC"), and the global headquarters of its parent company, FANUC CORPORATION, Japan, located at 3580, Shibokusa-Aza-Komanba, Oshinomura, Yamanashi Prefecture, Japan – 4010597.

10. Partnership with INCIT

International Center for Industrial Transformation has collaborated with NAMTECH to jointly offer SIRI-COSIRI Assessor Training Program in India, create opportunities for NAMTECH faculty to build skills as a qualified, collaborate on advisory and consultancy projects using SIRI-COSIRI as a framework and to incorporate SIRI-COSIRI concepts into NAMTECH programs.

MEMORANDUM OF UNDERSTANDING

PREAMBLE : **NEW AGE EDUCATION AND SKILLS FOUNDATION**, a not for profit company established by ArcelorMittal Nippon Steel India Limited (AMNS), founded an educational institute named New Age Makers Institute of Technology (NAMTECH).

THIS MEMORANDUM OF UNDERSTANDING ("MOU") is made this third day of July 2024 ("Effective Date"),

BETWEEN:

A. **INTERNATIONAL CENTRE FOR INDUSTRIAL TRANSFORMATION** (Unique Entity Number: 202117688C), having its primacy business location at 10 Collyer Quay, Level 37, Ocean Financial Centre Singapore 049315, (hereinafter referred to as "**INCIT**") of the first part,

AND

B. **NEW AGE EDUCATION AND SKILLS FOUNDATION**, a not for profit company established under Section 8 of Indian Companies Act, 2013 (CIN No. U80902GJ2023NPL138476)_is having its registered office at AMNS House, AMNS Township, 27km, Surat- Hazira Road, Hazira, Surat 394270, India, (hereinafter referred to as "**NAMTECH**") of the last part,

11. Partnership with L&T

L&T Heavy Engineering has collaborated with NAMTECH for the capstone projects in the areas including visual inspection using drone and AI/ML, drone-based surveillance, cost thermal camera, automation of circular seam setup, and lidar for continuous scanning of plates for dimension measurement during bending operations.

LETTER OF INTENT (LoI)

2nd May 2024

To,
New Age Educational Skills Foundation,
New Age Makers' Institute of Technology ("NAMTECH")
Research Park, IIT Gandhinagar Campus, Palaj, Gandhinagar, Gujarat - 382055, India

Subject: Letter of Intent for Collaboration for Industry - Academia Projects

Dear Dr. Gupta,

L&T Heavy Engineering (L&T HEIC) is pleased to collaborate with NAMTECH regarding Capstone projects ("Projects").

12. Partnership with HyTech Automation

HyTech Automation has collaborated with NAMTECH for the capstone projects. This collaboration is envisioned to catalyze innovation and foster talent development for the manufacturing sector.

LETTER OF INTENT

21st June 2024

To,
New Age Educational Skills Foundation,
New Age Makers' Institute of Technology ("NAMTECH")
Research Park, IIT Gandhinagar Campus, Palaj, Gandhinagar, Gujarat - 382055, India

Subject: Letter of Intent for Collaboration for Industry-Academia Projects

Dear Dr Gupta,

Hytech Automation is pleased to collaborate with NAMTECH regarding Capstone Projects ("Projects").

13. Partnership with Marconi Technologies

Marconi Technologies has collaborated with NAMTECH for the capstone projects in the areas including robotic path optimization, factory resource utilization and power consumption, and digitalization and virtual commissioning of bottle filling, inspections, and sorting stations.

LETTER OF INTENT

21st June 2024

To,
New Age Educational Skills Foundation,
New Age Makers' Institute of Technology ("NAMTECH")
Research Park, IIT Gandhinagar Campus, Palaj, Gandhinagar, Gujarat - 382055, India

Subject: Letter of Intent for Collaboration for Industry-Academia Projects

Dear Dr Gupta,

Marconi Technologies is pleased to collaborate with NAMTECH regarding Capstone Projects ("Projects").

14. Partnership with MG Motors India

MGI will provide faculty/instructor training for conducting the MG Nurture Program on course as per the module developed by MGI service process and quality department to the eligible students at NAMTECH. MGI will further conduct follow-up programs and provide inputs to upgrade the skills of the students in the field of automobiles and electric vehicles.

Memorandum of Understanding (MOU)

This MOU is executed at Vadodara on this 28th Day of June 2024.

MG Motor India Private Limited, a Company incorporated under the Companies Act, -1956, having its Registered and Corporate Office at Milestone Experion Centre, 10th Floor, Sector-15, Part-II, Gurugram, Haryana (hereinafter referred to as "MGI", which expression shall, unless excluded by or repugnant to the context, be deemed to mean and include its successors in interest, administrators and permitted assigns) of the ONE PART

and

New Age Education and Skills Foundation, a not for profit company established under Section 8 of Companies Act, 2013 by ArcelorMittal Nippon Steel India Limited, founded an educational institute named New Age Makers Institute of Technology, is having its registered office at AMNS House, AMNS Township, 27km, Surat- Hazira Road, Hazira, Surat 394270, India (hereinafter referred to as the "**Institute**" which expression shall unless repugnant to the context or meaning thereof, include its successors and permitted assigns) of the OTHER PART.