Proposal to establish a
Grand Challenges Scholars Program at

Nirma University, India

Submitted by
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NIRMA UNIVERSITY
NAAC ACCREDITED 'A' GRADE

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1. Introduction

The National Academy of Engineering (NAE) has identified 14 Grand Challenges for Engineering and called for a new engineering education paradigm – the Grand Challenges Scholars Program (GCSP) – to prepare engineers to address those challenges and change the world. The GCSP has now been implemented at 51 engineering schools around the world, with over 120 more schools planning to join this initiative. So far there are no engineering schools from India that have joined the Grand Challenges Scholars Program.

Nirma University is pleased to submit this proposal to establish a Grand Challenges Scholars Program (GCSP) at Nirma University. This will be the first university from India to establish a GCSP, which is essential not only for promoting the engineering education at Nirma University, but also for mentoring other institutions (nationally/internationally) interested in developing the GCSP in future.

2. About Nirma University

Nirma University is one of India's leading universities based in Ahmedabad (Gujarat). The University was established in the year 2003 as a Statutory University under a special act passed by the Gujarat State Legislative Assembly. It is recognized by the University Grants Commission (UGC) under Section 2 (f) of the UGC Act. The University is duly accredited by National Assessment and Accreditation Council (NAAC) with 'A' grade. The University is a member of Association of Indian Universities (AIU) and the Association of Commonwealth Universities (ACU).

Nirma University has committed itself to develop cutting-edge technologies, promote innovation in its students, provide opportunities for young leaders to emerge, and encourage higher academic standards. It aims at producing not only good professionals but also good and worthy citizens of the world, aiding in its overall progress and development. It endeavors to treat every student as an individual, to recognize their potential and to ensure that they receive the best preparation and training for achieving their career ambitions and life goals.

The University has seven constituent institutes and one department offering Undergraduate, Postgraduate and PhD programs:
Institute of Technology
Institute of Management
Institute of Pharmacy

Institute of Law
Institute of Science
Institute of Architecture and Planning
Institute of Commerce
Department of Design

3. About Institute of Technology

Institute of Technology, Nirma University, earlier known as Nirma Institute of Technology, started in 1995 by Nirma Education and Research Foundation (NERF), was the first self-financed engineering college in Gujarat. Within 18 years of inception, Institute of Technology is a leading hub of education, offering multidisciplinary undergraduate, postgraduate and Ph.D. programmes in engineering.

The institute is ranked within top 25 self-financed engineering colleges of India in a survey conducted by various rating agencies. The Institute presently has more than 4500 students and 180 faculty members, making relentless efforts for making a mark with their presence globally. The campus vibrates with not only world class curricular activities but also with myriad activities like international conventions, symposia, conferences, student competitions, conclaves, short-term industry relevant programs, cultural activities and many more.

The Institute is embarking on an ambitious plan focused on "*Growth in Excellence*" and creating the "*Societal Engineer*". The Institute is now aiming to emphasize on Outcome Based Education (OBE), Experiential Education (through Project Based Learning), research in thrust areas with translational impact, and the creation of engineers as leaders in society.

4. Vision of Nirma University for GCSP

We share the same objective with the NAE's GCSP, which is to educate the future leaders to address the Grand Challenges for Engineering. The Nationals Academy of Science's 14 Grand Challenges for Engineers as mentioned below are at heart of the next generation's impact on the world:

Advance personalized learning
Make solar energy economical
Enhance virtual reality

Reverse-engineer the brain
Engineer better medicines
Advance health informatics
Restore and improve urban infrastructure
Secure cyberspace
Provide access to clean water
Provide energy from fusion
Prevent nuclear terror
Manage the nitrogen cycle
Develop carbon sequestration methods
Engineer the tools of scientific discovery

The broad possibilities of a new generation of diverse leaders that are focused on the complex issues of the Grand Challenges provide global educational possibilities, entrepreneurial research alternatives, service learning opportunities, and leadership development for our next generation of graduates. The Institute of Technology at Nirma University already offers strong opportunities for pursuing each of the required GCSP elements. The GCSP will provide our students with broad education and global perspectives, and motivate them to increase their academic engagement and innovation ability throughout their years at Nirma University to address one of the four major schemes identified by NAE: Sustainability, Health, Security, and Joy of Living.

Our Motto is to lead the life towards knowledge from ignorance, which obscures our mind in understanding the reality. As the only remedy from darkness is light, the only remedy from ignorance is knowledge. Our Vision is to shape a better future for mankind by developing effective and socially responsible individuals and organizations. Our foresight is to have our GCSP help ensure the GC Scholars achieve the broadened education and innovative research training, addressing the Grand Challenges and to have our GCSP become a cradle for educating future engineering leaders and entrepreneurs with global perspectives and social awareness.

Nirma University expects its GC Scholars to be able to recognize and act on their ability to make real efforts towards solving the world's Grand Challenges. GC Scholars will solve the most pressing issues of today to meet the basic needs of all people and improve the general welfare of all human beings. Nirma University expects them to understand that it takes people from various disciplines to solve these problems, which must be considered from different angles.

5. Selection of Grand Challenge Scholars

Students interested in the Grand Challenges Scholars Program must have demonstrated academic excellence within the institute to apply, as academic achievement is an important component of success in any of our scholars programs. However, the student's response on the proposed GCSP portfolio and evidence of a commitment to the program will be major factors in considering prospective applicants. Undergraduate students with engineering major, interested in participating in the GCSP and having CGPA above 8.0 / 10.0, will apply to enter the program after their first semester, but no later than their third semester at Nirma University. It is expected that 15-25 students with engineering major (on an average 20) will be recruited each year and about 06-08 students will graduate when in steady state. While we shall start with developing the program for engineering majors, we may later consider to include undergraduates from outside of engineering.

Interested students will submit an application that includes:

- A statement of commitment
- A preliminary Research Proposal / Reflection Report related to the selected grand challenge
- Copies of transcripts, indicating the candidate's academic results
- At least one recommendation from faculty mentor

The information that students provide in the application form(s) will be used for selection of applicants by the steering committee of the program. Successful candidates will be notified of their acceptance to the program within 30 days of submission.

Each GCSP Scholar must prepare to help develop effective and economical solutions to one or more of the engineering grand challenges that this nation and the world faces. To remain in the program GCSP Scholars must:

1. Meet at least twice a semester with their GCSP Mentor
2. Submit a progress report (once a semester) to their GCSP Mentor, to be signed and forwarded to the GCSP Director, outlining their accomplishments for the past academic semester and detailing their plan for the upcoming academic semester
3. Attend GCSP Seminars/Presentations at least twice a semester, organize one before graduation.
4. Present their research project at a summit, symposium or at the National GCSP Summit during their graduating year of school.

The final report should define the means of the completion of each of the five curricular requirements of their plan and the overall focus of their work, describe the breadth and depth of their specific program. It is expected that students in the GCSP will present their work and network with other GCSP scholars at one of the local or regional GCSP Summits or research symposia.

The scholar shall commit to a GC (one or more) throughout their journey, chosen by him/her as per their interest, however there will also be a provision to allow scholars to change their choice of GC. This shall come for approval to the GCSP steering committee through Faculty mentor of that particular Scholar.

The head of Students' union (student representative) has been included as a member in the GCSP Steering Committee. The scholar can appeal regarding rejection from the program, at any stage, to the GCSP Steering Committee through the head of students' union. The cumulative decision of the GCSP Steering Committee will be binding to everyone.

Following rubric shall be used during the interview for selecting scholars:

Grade Component (Weight)	**Does Not Meet Expectations**	**Approaching Expectations**	**Meets Expectations**	**Exceeds Expectations**
Literature review / Background (15%)	0 - 3%	4 - 7%	8 – 12%	13 - 15%
	▯ The literature review lacks comprehensive coverage of relevant material ▯ The purpose of the study is not clearly described ▯ There is no connection between the material reviewed and the purpose of the study	▯ The literature review is relatively comprehensive and describes some relevant material ▯ The purpose of the study is described, but not as clearly as it might be ▯ There is some attempt to connect the material reviewed with the purpose of the study	▯The literature review is relatively comprehensive and describes most relevant material, although significant gaps still exist ▯ The purpose of the study is adequately described ▯ There is a good attempt to connect the material reviewed with the purpose of the study	▯The literature review is very comprehensive and describes relevant material ▯ The purpose of the study is clearly described ▯ There is an excellent connection between the material reviewed and the purpose of the study
Importance and innovation (25%)	0 – 4%	5 - 10%	11 - 20%	21 - 25%

	▯ The proposed study does not tackle an important issue and there is no attempt to build on previous research ▯ There are no innovative elements in the proposed study	▯ The proposed study is relatively important and there is an attempt to build on existing research ▯ There are only a small number of innovative elements in the proposed study	▯ The proposed study is important and there is a good attempt to build on existing research ▯ There are a number of innovative elements in the proposed study	▯ The proposed study is very important and nicely builds on existing research ▯ The proposed study is extremely innovative
Implementation methods (25%)	0 – 4%	5 - 10%	11 - 20%	21 - 25%
	▯ No methods section is included in the proposal or many key elements of the methods are absent	▯ A methods section is presented, but numerous elements of the methods are absent or described insufficiently.	▯ In methods section, only a few elements of the methods are absent or described insufficiently	▯ A methods section is presented clearly, and the section is missing none of the key elements.
References (15%)	0 - 3%	4 - 7%	8 – 12%	13 - 15%
	▯ Major problems exist with references ▯ Many citations in the body of the proposal are missing ▯ Reference list is either absent or seriously problematic	▯ An attempt has been made to deal with references in the proposal ▯ Some citations are missing in the body of the proposal ▯ Some references are missing in the reference list or the reference list is slightly problematic	▯ A good attempt has been made to deal with references in the proposal ▯ There are very few problems with the citations in the body of the proposal ▯ There are very few problems with the reference list	▯ Referencing is excellent ▯ There are no issues with citations in the body of the proposal ▯ There are no issues with the reference list
Questions / Answers (20%)	0 – 2%	3 - 7%	8 - 16%	17 - 20%
	None of the questions answered.	Few questions were answered	Most of the questions answered	All questions were answered

6. GCSP MENTOR & STEERING COMMITEE

Each applicant must select a GCSP Mentor (i.e., faculty member) who will guide the student through the entire program. The mentor will review the student's initial portfolio and submit a letter of commitment with the student's application to the Steering Committee. Scholars are required to meet with their mentors every semester to provide progress updates on their present program and to plan for the next semester's goals. Upon conclusion of the program, the GCSP Mentor must write a letter of completion to the GCSP Steering Committee in support of the GCSP application to be named as Nirma University Grand Challenges Scholar. Once identified, all prospective GCSP Mentors will be given guidance on the Grand Challenges and the GCSP prior to submitting the letter of commitment. In case a mentor either leaves the institution or discontinues before the student has completed the program, GCSP Director at NU will take over the responsibility of that particular mentor by default or the Steering Committee will decide the replacement.

The role of the Steering Committee consists of the following responsibilities:

1. Review student applications to GCSP and assess applications for program entry;
2. Oversee curricular development and work with faculty advisors on student progress;
3. Identify and characterize fit of new, co-curricular and extra-curricular activities and experiential learning opportunities that support GCSP objectives;
4. Review and approve changes to the structure of the GCSP program.

The GCSP administration team will include the GC Director, Directors of the eight constitute institutes of the Nirma University, which compose the GCSP Steering Committee and GC Mentors. The various activities under the 5 components of GCSP to address 14 Grand Challenges requires extensive organization, management and communication to guarantee the smooth operation of program. The GC Director will administer, oversee and assess the GCSP in conjunction with the Steering Committee and therefore a specific faculty member will be needed to work full time for this. The GC Director should have the excellent communication and organization skills with the strong dedication towards the GCSP program. The GC Director should also have an international exposure and experience with overseas study background and a keen perspective to ensure implementation of the five components of GCSP. The GC Director will liaise with faculty and staff on GCSP matters as needed, and suggest new topics and skills to be included in the GCSP program.

Dr. Mehul R Naik will act as the GCSP Director at Nirma University, under the direct supervision of the Vice President and Director General. Dr. Naik did his Masters of Engineering in Electrical Engineering in 1993 from Stevens Institute of Technology, New Jersey, USA; and Ph. D. in RF Circuit Design in 2015 from Kadi Sarva VishwaVidyalaya University, Gandhinagar, India. He has 15 years of work experience in industry and 10 years in academics. He currently serves as an Associate Professor in the department of Electronics and Communication Engineering, Head of

the University Office of International Relations and the Head of the Centre for Entrepreneurship at Nirma University. Dr. Naik is a member of IETE, ISTE, and IEEE. The Steering Committee will advise the GCSP Director on strategy and operational issues to facilitate continuous improvement and oversee the Scholars selection process.

The GC mentors will be responsible for evaluating the Scholars' research performance in unification with the Steering Committee. The faculty mentors will come from the six engineering disciplines of the institute of technology at Nirma University, whose research fields are related to the four themes (sustainability, health, security and joy of living) addressing the 14 Grand Challenges. The administration of the GCSP will be integrated with the overall administration of the faculty. As part of their regular educational/service duties the mentors do not receive extra financial remuneration for the GCSP role. They participate in the Scholars selection process, help to link individual GC Scholars with research opportunities within their departments or within interdisciplinary groups with whom they collaborate, and help to advise Scholars on course selection and on how to complete the five components of the GCSP program. The GCSP Steering Committee will do the selection of GC mentors through interviews.

7. Grand Challenge Components

The importance of a student's experience in the Grand Challenges Scholars Program is based upon the completion of the 5 components – through a combination of curricular, co-curricular and extracurricular experiences, tied specifically to a chosen Grand Challenge theme. Scholars are required to undertake requirements in each of the following five components: *creative technical competency*, *multidisciplinary competency*, *business competency*, *multicultural competency* and *social consciousness competency.* For depth, scholars will be expected to complete *minimum two or more* requirements in following components:

Components	Requirements
1. *Creative technical competency*	1. Engage in a minimum of one semester of undergraduate research in an approved team or individual research or design project with a university faculty member or summer research internship at university or industry, focusing the research on one of the grand challenge themes including a presentation of their findings/experience and an evaluation of their research by a faculty research supervisor. The work must involve creativity and innovation. 2. The students can register for an independent research, directed by a faculty member, or perform the an independent research in an

	industry or government lab focusing the research on one of the GCSP themes. Prior to conducting the research, the students will provide a written scope of the work to be performed during the semester(s). The prospective work must be approved by the instructor/researcher and the student's GCSP Mentor. In addition, the students will be required to present their findings in a poster exhibition at one of the university's undergraduate research symposiums or at a professional meeting. 3. The student can register his / her innovative idea in "Idea Lab Project" that is funded by the university. The faculty panel mentors the Idea lab project. The objective is to motivate students implement their ideas into an innovative commercial solution.
2. *Multidisciplinary competency*	1. GCSP student can take undergraduate level electives outside of engineering from other institutes of the Nirma University like Management, Law, Pharmacy, Design, Commerce, etc. The B. Tech. curriculum requires students to take one University elective and one Institute elective course in 3rd and 4th year. 2. GCSP student can register for the major project as required by the 4th year curriculum as interdisciplinary project by teaming up with students of other disciplines. 3. Four to six weeks internship with an interdisciplinary focus in one or more of the GCSP topics (approved by GCSP Mentor)
3. *Business competency*	1. GCSP student should be capable of translating invention and innovation into market ventures and possibly global solutions required for the public's interest. The student should work as per directions of Centre for Entrepreneurship at Nirma University and participate in all its annual activities including Expert Lecture series, Interactive sessions, Startup Weekends, Business plan Competition, etc. 2. Internship with a significant entrepreneurial focus (approved by GCSP Mentor & program oversight committee) 3. Register for the approved elective course(s) which focus on entrepreneurship. 4. Register with the Minor specialization – "Entrepreneurship".
4. *Multicultural competency*	1. GCSP student should develop the perspective necessary to address challenges that are inherently global as well as to lead innovation in a global economy. To accomplish this, he/she can register for the

	approved international work experiences, internships, research experience outside India with a significant global focus by doing summer research internship in university / industry abroad 2. Elective Course(s) which focus on global issues. 3. Participate in a Student Exchange Program at one of the international partners of Nirma University 4. Any other related activity as defined by the GCSP director.
5. *Social consciousness competency*	1. GCSP students should develop and deepen their social awareness and demonstrate motivation to bring technical expertise to bear on societal problems by registering into the course on community service. 2. GCSP student should volunteer with an approved community service program and assume a leadership role in community volunteering outside the university campus. 3. GCSP student should work as volunteer for 20 hours during on-campus events/activities. 4. Any other related activity as defined by the GCSP director.

Each Grand Challenge Scholar Program (GCSP) student must work with their faculty mentor and the GCSP Director to complete a portfolio providing evidence of satisfactory achievement of the five GCSP components. Students must submit the final portfolio electronically in a .pdf format to the GCSP Director and Steering Committee for approval.

The proposed activities (elective courses, mini projects, internships, etc.) must relate to the selected Grand Challenges theme – it is mandatory. The GCSP Director and faculty mentors will make sure that the required linkages happen.

8. Grand Challenges Scholars Recognition

Nirma University will recognize GSCP Scholars through a variety of mechanisms. Along with receiving recognition on the NAE website, students who complete the GCSP requirements will be formally recognized as follows:

- Every year a GCSP Scholars display will be featured at National Technological Symposia, the annual technology festival held on campus. At this festival, GCSP Scholars at all levels will have the option to publicly present some of their accomplishments and experiences in the program.
- An annual "GCSP Celebration" will be held at the completion of program to recognize the graduating scholars.
- Scholars will receive a medal and be recognized in the Nirma University Newsletter bulletin as being a Grand Challenges Scholar.

9. Funding and Support

The sustainability of this program is an important consideration for Nirma University. We are realistic that these programs cannot succeed without sustained commitments and resources by university administration. Based on our analysis we believe there are a number of resources required for sustainability including a stipend plus course release for a director, staffing needs, a marketing budget, support for student projects, stipends for mentors, etc. As other needs are identified after the first year, the budget will be supplemented as needed.

We have identified internal permanent resources and endowments that will help cover these costs. Additionally, we will be working with our Placement Office to identify companies and donors who may want to sponsor a grand challenge and provide additional funding to support students and faculty. We also believe we can leverage other funding (sponsored research or development) to help support our GCSP.

10. GCSP Steering Committee

GCSP Steering Committee	**Name**	**Email**
Vice President, Nirma University	Shri K. K. Patel	vp@nirmauni.ac.in
Director General, Nirma University	Dr. Anup K. Singh	dg@nirmauni.ac.in
GCSP Director	Dr. Mehul R Naik	mehul.naik@nirmauni.ac.in
Director, Institute of Technology	Dr. Alka Mahajan	Director.it@nirmauni.ac.in

Additional Director, ITNU	Dr R N Patel	addldirector.soeit@nirmauni.ac.in
Director, Institute of Science	Dr. Sarat Kumar Dalai	Director.is@nirmauni.ac.in
Director, Institute of Management	Dr. Mallikarjuna	Director.im@nirmauni.ac.in
Director, Institute of Pharmacy	Dr Manjunath Ghate	Director.ip@nirmauni.ac.in
Director, Institute of Law	Dr Purvi Pokhariyal	Director.il@nirmauni.ac.in
Director, Institute of Architecture & Planning	Prof Utpal Sharma	Director.im@nirmauni.ac.in
Dean, Institute of Commerce	Prof Udai Paliwal	Director.im@nirmauni.ac.in
HoD, Department of Design	Prof Manjula Shroff	HoD_design@nirmauni.ac.in
Advisor, International Relations	Dr Abhijit Pandya	abhijit@nirmauni.ac.in
Director, Research and Innovation	Dr. Dhaval Pujara	Director.ri@nirmauni.ac.in
Senior Student Representative	Head of Students' Union	--
Industry Representatives	ISRO, Intel, others	

11. Uniqueness

The overall objective of the Grand Challenges Scholars Program at Nirma University can be summed up in a few words: an integrative learning experience with diverse partners and stakeholders focused on making a meaningful difference in the world. Integrative learning means linking the classroom to the world and making a meaningful difference in the world, where our students will leave Nirma University not only with a sense of personal and professional purpose, but with a deep sense of themselves as citizens and members of a global community. In a sense, this notion of citizenship is also integrative in that it encourages all our students to see themselves as part of a bigger picture. The ultimate objective, then, is to prepare students to be part of global solutions to our most pressing human problems.

GCSP program at Nirma University will equip more graduates to become leaders in their fields through a well-designed blend of innovative curricular, co-curricular, experiential offerings, international partnerships and industry connections. GCSP program at Nirma University will be a center of innovation, creativity, and entrepreneurship that will serve as an important economic

engine for the region and the nation. GCSP Scholars will be well-equipped with the skills and will have access to reframe interconnected challenges with a host of cultural, social, political and human complexities challenges. Nirma University has the faculty, institutional will, integrative curricular links, international partnerships and industry connections to build such a program. Students both in and out of the GCSP will benefit from increased interdisciplinary collaboration in courses and projects. Joint activities among faculty from disparate yet complementary academic components will open up organizational boundaries and encourage collaboration inside and outside the classroom.

Nirma University is highly Multidisciplinary with Eight Institutes working under it along with dedicated offices for International Relations, Centre for Entrepreneurship, Directorate of Research and Innovation, Center for Continuing Education, which all fits for the five major components required by GCSP and provide a solid foundation for implementing GCSP at Nirma University. Faculties at Nirma University conducts cutting-edge researches in fields ranging from physical sciences and medicine to public health and industrial management, which offers the global perspective and a wide variety in addressing the Grand Challenges of Engineering in the 21st century. In addition, the GCSP at Nirma University will be the first program to be established in India. India is experiencing fast economic development with increasing population, which brings unprecedented challenges for engineering. To address the complex Grand Challenges in India will provide valuable experiences for other countries, and the GCSP at Nirma University will also provide example and experience for expanding it to more universities in India and other Asian countries.

Appendix 1

Existing courses at Nirma University related to Grand Challenges

Sustainability	HR608 Training & Development HR605 Performance Management OB602 Negotiation Skills FB604 Managing A Growing Organization 2SPPH114 Environmental Studies 2BAL215 Money and Capital Market 2BAL311 Economic Development and Policy 2BBL418 Financial Management
Health	2PH113 Human Anatomy, Physiology and Health Education 2PH111 Fundamentals of Pharmaceutics 2PH214 Human Anatomy and Physiology 2SPPH113 Yoga and Health 2PH411 Hospital and Community Pharmacy 2EBLN01 Nutrition and Health I

	2SPN21 Nutrition and Health II (Cooking) 2EBLM04 Meditation
Safety	GBLCC Global Business Leadership in Cross Cultural Contexts 2SPPH115 Cyber Security 2SPPH116 Professional Ethics including Human Rights 2BL225 Community and Applied Social Psychology 2BL905 Human Rights and International Humanitarian Law 2OC1020 Disaster Management and Law
Joy of Living	2ITA01 Indian Culture FB606 Social Entrepreneurship OB603 Personality Development and Business Etiquette FB605 New Venture Creation 2SPPH117 Social Extension Activity 2EBLE08 Ethics and Morality 2EBLP02 Performing Arts (Drama I) 2SPP22 Performing Arts (Drama II) 2EBLF33 Fine Arts (Painting I) 2EBLF42 Fine Arts (Painting II) 2EBLCW33 Creative Writing (I) 2EBLCW43 Creative Writing (II) 2EBLM33 Movie making 2EBLP41 Photography

Appendix 2

Industry Connections

Employers value the graduates who are well-prepared to move into leadership positions and demonstrate the capacity to think critically, communicate clearly, and solve complex problems. Through the integration of the GCSP program, our graduates will continue to acquire new capabilities, access counterintuitive knowledge and develop an appreciation for life-long learning, which would be quite appreciative by our current employers' connection.

List of Companies	
Aakash Institute	JK Laxmi Cement
Accenture India Private Limited	JMC Projects India Limited
Active Star Software	Johnson Controls Inc. India
Adani Port & Sez Limited	Jubilant Life Sciences Ltd
Adani Ports & Special Economic Zone Limited	Jyoti Limited
Aditya Birla [Birla Cellulosic]	Kalpataru Power Transmission Limited

ADOBE Systems India Pvt Limited	KEC International Limited
Airvana Networks India Pvt.Ltd	KHS Machinery
Alembic Engineering Science Institute	Kothari Infotech Limited
Alembic Pharmaceuticals Ltd	Larsen & Toubro Limited
ALLEN Career Institute	Larsen & Toubro Tech Services
Amazon India	Linde Engineering India Pvt Ltd
Amtech Electronics (India) Limited	Loginext Solutions
Apttus India	Mahindra & Mahindra Limited
Argusoft India Limited	Mahindra Gears & Transmissions Pvt. Ltd.
Arm Technologies	MAQ Software
Asea Brown Boveri Limited [ABB]	Maruti Suzuki India Ltd
Asia Motors Private Limited	Marwadi Education Foundation Group Of Institutions
Asian Paints Limited	Meccademia Group of Educational Institution
Atmiya Institute of Technology & Science	Mechartes Researchers Pvt. Ltd.
ATOS Corporation	MEGA Co. Ltd
ATUL Limited	Microsoft India Private Limited
Barclays	Millimeter Design
BASF India Limited	Misys International Financial Services Private Limited
Bayer India Limited	Modiarc Electrodes Co. Limited
BGR Energy Systems Limited, Chennai	Mordor Intelligence LLP
Bhagwati Associates Pvt. Limited	Morgan Stanley
Biersdorf	Mother Dairy India Limited
Blue Star Limited	Motorola India Private Limited
Bombardier Inc.	Mu Sigma Inc
Bosch India	N Vidia
Broadcom Corporation	N.K. Shah Cosultant
Cadila Healthcare Limited	National Instruments Systems (India) Private Limited
Capgemini India Co. Private Limited	Neilsoft Limited
Cargill Inc.	Neutron System Pvt. Ltd
Caterpillar India Pvt. Ltd.	Nirma Limited
CBM Engineers	Nokia Siemens Limited
Cloud that Technolgies	NOVATRICE Technologies
CMC Limited	Nvidia Graphics Private Limited
Cognizant Technology Solutions India Private Limited	Oracle Corporation
Coromandal Inc	Parul University
Crompton Greaves Limited	Persistent Systems Limited

Cybage Software Private Limited	Petrofac Engineering India Pvt Ltd
Daikin Airconditioning India Pvt Ltd	Philips India Pvt Limited
DCM Shriram Ltd	Power H2O, Vatva Ahmedabad
Deepak Nitrite Limited	Practro
Deloitte Consulting India Private Limited	Prima Automation India Private Limited
Denag Cranes & Components India (P) Ltd.	Quanta Process Solutions Pvt. Ltd.
Directi Internet Solutions Pvt Ltd	Real Soft (Intl) Private Limited
DLF Limited	Reliance India Pvt Limited
Dolcera ITES Pvt. Ltd.	Reliance Infocomm Limited
DOLPHIN Steel Construction LLC	RKC Infrabuilt Pvt. Ltd.
Dorf Ketal	RTCamp Solutions
Doshi ION Exchange & Chemical Industries Limited	Sabarmati Gas Limited
Dresser Rand India Private Limited	SAI Consulting Engineers Pvt Limited
Ducon Consultant	SAL college of Engineering SAL Technical Campus, Ahmedabad
eClinical Works	Samsung India Electronics Pvt. Ltd.
Eicher Motors Limited	Samsung Research Lab
eInfochips India Pvt Ltd	Sanmar Group
Electrotherm Limited	SAP Labs India Limited
Elitecore Technologies Limited	Saunrachana Strucon Private Limited
EMCO Limited	Schneider Electric
Emerson Process Management (I) Private Limited	Searce
Entity Solutions Limited	Secure Meters Limited
Erhardt + Leimer (India) Limited	Semitronix Corporation
Erricson India Private Limited	Shapoorji Pallonji & Co. Limited
Essar Steel	Sheladia Associates
Essar Services India Pvt Limited	ShoreTel
ETA Engineering Private Limited	Shriram Alkali & Chemicals
Evolutionary Systems Pvt. Ltd.	SHV Energy Private Limited
Excel Technical & Industrial Supplies LLC	Sibridge Technologies
FactSet Systems India Pvt. Ltd.	Siemens Limited
FAG Bearings India Limited	Silicon Engineering Consultants Pvt. Ltd
Feast Software Private Limited	Silver Oak college of Engineering & Technology
Ferromatik Milacron Limited	Snapdeal
FIAT India Automobiles Pvt. Ltd.	Sokrati
Fiserv	Solu-Soft India Private Limited
FLD Smith Limited	SOPHOS

Ford India Private Limited	ST Microelectronics Private Limited
Freescale Semiconductors Limited	Suzuki Motors India Limited
Future First Info Services Private Limited	Synopsys (India) Private Limited
Galaxy Surfactants Limited	Syntel Limited
Gammon India Limited	Tata Autocomp Limited
Gandhinagar Institute of Technology	Tata Chemicals Limited
Gannon Drunkenly & Co. Limited	Tata Consultancy Engineers Private Limited
Gateway Technolabs Private Limited	Tata Consultancy Services
Gujarat Chemical Port Terminal Company Limited	Tata ELXSI Limited
GEA Process Engineering (India) Limited	Tata Motors Limited
GHCL Limited	Tata Power Company Limited
GMMCO Limited	Tata Teleservices Limited
Godrej & Boyce Mfg. Co. Limited	Tatva Institue of Technology
Goldman Sachs Services Private Ltd.	Tatvik Technologies Private Limited
GSFC [Gujarat State Fertilizers Corporation]	Teach for India
Gujarat Gas Company Limited	Tech Mahindra Limited
Gujarat International Finance Tec City Company Limited	Technoforce Solutions (I) Pvt. Ltd.
Gujarat Power Engineering & Research Institute	Thermax Limited
Gujarat State Fertilizer Corporation	Think & Learn Pvt. Ltd
Gujarat State Petronet Limited	Thorogood Associates India Pvt. Ltd.
Hewlett Packard India Sales Private Limited	Thyssenkrupp Industrial Solutions (India) Private Limited
Hindustan Coca Cola Beverages Pvt. Ltd.	Torrecid India
Hindustan Construction Company Limited	Torrent Pharma Limited
Hindustan Unilever Limited	TORRENT POWER LIMITED
Hirel Electronics Private Limited	Translink Infrastructure Consultants
Hitachi Home & Life Solutions (India) Limited	Transpek Industries Limited
Hitachi Hi-Rel Power Electronics Pvt. Ltd.	TVS Motor Company
HSBC	Ultratech Cement Limited
Hyundai Motor Company	Unigraphics Software
Hyundai Motor India Limited	Unikaihatsu Software Private Limited
IBM India (P) Limited	UPL Environmental Engineers Limited
ICICI Bank Limited	Urban Restro
IFB India Private Limited	Vardhman Acrylics Limited
I-Flex India Private Limited	Vavni Services Private Limited

I-many Software Private Limited	VC-ERP Consulting Private Limited
Impetus InfoTech (India) Private Limited	Vedanta Resources
INBISCO India Pvt. Ltd.	Veeral Controls Private Limited
Indian Oil Corporation Limited	Vijay Shekhar Academy
Indian Rayon and Industries Limited	Viraj Profile Limited
Indrashil Institute Of Science And Technology	VIT Andhra Pradesh
Indusa Infotech Pvt Limited	Vodafone India Private Limited
Infibeam	VVP Engineering College, Rajkot
Infinite Consultant	Wellspun India Limited
Infinium Solutionz Limited	Wipro Technologies
InfoStretch Solutions Pvt Ltd	WSP Parsons Brinkerhoff India
Infosys Limited	Xilinx
Ingersoll Rand	Xylem Water Solution Private Limited
Intel Corporation	Yokogawa India Limited
Ishi Information System India Pvt Ltd	Zensar Technologies Limit
ITC Hotels	Zeppelin Systems India Pvt. Ltd
ITD Cementation India	Zeus Learning
Jacobs Engineering Private Limited	

Appendix 3

List of International Partners

Collaborative Foreign University/Institution
Hof University, Germany
Skyline University, UAE
Innovation Hub Beiersdorf, Germany
University of Wyoming, USA
ESCOLA DA CIDADE, Brazil
Florida Atlantic University, USA
Memorial University of Newfoundland, Canada
Binghamton University ,USA
University of Georgia, USA.
Carleton University, Canada
Pennsylvania State University, Penn State Law, USA
Changwon National University, South Korea
Coventry University, UK

Wolkite University, Ethopia
Wadhwani Operating Foundation, USA
Strathmore University, Kenya
University of Johannnesburg, South Africa
Iowa state University, USA
University of Newcastle, Australia
ENSA NANTES, France
PPM School of Management, Indonesia
GEMS Education, UAE
University of Southern California, USA
NLSIU, Banglore
MCPHS, USA
UniTO, Italy
Plodiv University, Bulgaria
School of Architecture in Marne-la-vallee,France
ITER International Fusion Energy Organization, France
Illinois Institute of Technology, USA

The partnership scope with all above mentioned universities broadly consists of and includes Student Exchange, Faculty Exchange and Joint Research.

Appendix 4

Research Projects/Initiatives at Nirma University aligned with the grand challenges

Sr. No.	Project Title	Principal Investigator (s)
1	Application of Precast Products made using Bottom ash and Fly ash for Rural Pavements and other Infrastructure in India	Prof. Urmil V. Dave, Dr. Rishi Gupta
2	Security Enhancement on GSM Stream Cipher using a Combination of Variable Tap Mechanism and Nonlinear Combination Functions on Linear Feedback Shifts Registers	Dr. Priyanka Sharma, Dr. Srinivas Sampalli
3	Design and Development of intelligent Infrastructure prototype Model for Monitoring Railway track	Dr. Kamal Narayan prasad Mehta
4	Development of Low cost methodology for Surveying and Mapping	Dr. Parul R Patel, Prof. Hemang A Dalwadi
5	Identification, analysis and improvement of accident black spots using GIS	Prof. Hemang A Dalwadi
6	Simultaneous Localization and Mapping using Autonomous Unmanned Aerial Vehicle	Dr. Dilip Kumar Kothari, Prof. Dipesh Jashvantbhai Panchal

7	Smart Home using brain mapping for physically challenged people	Prof. Dipesh Panchal, Prof. Jayeshkumar Patel
8	Design of Low Noise, Low Power, Automatic Gain Controlled Amplifier for Biomedical Applications	Prof. Dipesh Panchal, Prof. Akash Mecwan, Prof. Vijay Savani
9	Reduction of E-Factor in Dyes and Pigment Industries (Environmental Pollution Control)	Dr. Parin D. Shah
10	Employee Work Passion: Creating a Motivating Work Environment	Dr. Nina Muncherji
11	Communication requirements for disaster Management	Prof. Tripurasundari - Joshi
12	A study on issues in implementation of the maintenance and welfare of parents and senior citizens Act-2007 : A Sociological Exploration	Dr. Krishna Pal Pheru singh Malik, Miss. Bhumika Nanda
13	Application of Precast Products made using Bottom ash and Fly ash for Rural Pavements and other Infrastructure in India	Prof. Urmil V. Dave,Dr. Rishi Gupta from University of Victoria, Canada
14	Developing a remote sensing and GIS based system approach for flood forecasting and warning for lower Tapi basin	Dr. A. K. Singh
15	Calibration and validation of European Space Agency SMOS mission for Soil Moisture Mapping	Dr. Parul R Patel
16	Design Against Radiation Effects(DARE) ASIC Standard Cell Library for VLSI Circuits	Dr. Niranjan Maneklal Devashrayee, Dr. Nagendra Prakash Gajjar
17	Trajectory Planning for Robotic Arm for Automatic Damage Detection & Recognition of First Wall Tile Images in Tokamak using Image Processing and Machine Learning	Dr. Swati Jain, Dr. Priyanka Sharma
18	Study and Development of Domain Adaptive Classification Algorithm for Advanced Earth Observation and Annotation System	Dr. Tanish Hemalbhai Zaveri, Dr. Priyank B Thakkar, Prof. Pooja Prakashbhai Shah
19	Application of acoustic based technique for detection of machinery fault	Dr. Kaushik Mithabhai Patel, Prof. Dhaval Vallabhbhai Patel
20	Tribology with biodiesel: An experimental study to identify tribo- corrosion behaviour of different biodiesel	Dr. Absar Mohammad Lakdawala, Prof. Tejas N Raval
21	Process Development for Hydrogen Production through Solar Thermal Energy	Dr. R. K. Mewada, Dr. Sanjay Patel
22	Precision Agriculture Support system using wireless sensor and actuator network	Dr. Dilip Kumar Kothari, Dr. Manisha Asit Upadhyay
23	Studies on Biodiesel Production using Ultrasonic Techniques	Dr. A P Vyas, Dr. Milind H Joshipura

Appendix 5

A sample module, its objectives, outcomes and assessments

Component: Creative technical competency

Objective: Student registers into "IDEA Lab Project" by submitting an innovative idea and implementation details.

Outcomes: University provides mentors and funding to student. The student develops prototype model, validates it and finally develops Proof-of-Concept model.

Assessment: Following rubrics will be used for the assessment:
Assessment rubrics can be used for assessing learning at all levels. A rubric for assessment provide a range of criteria and expected performance standards. Assessors will evaluate a student's performance against set criteria. For major and minor projects these criteria are:

- Problem definition and project outline
- Inquisitiveness and problem solving ability
- Readiness to receive and evaluate peer's ideas, independent thinking and innovativeness
- Professionalism, team work and ethics
- Valuing the environment, socio and techno - economical responsibility
- Report writing and contribution of work
- Presentation skills
- Assessor will decide the attainment of each criteria by giving percentage of marks for respective criteria. Assessor will give percentage marks as per the table. Less than 50% will be given if not satidfied.
- Finally, A final consolidated level of attainment is decided for each student by taking the average of marks obtained in set criteria.

Criteria	**Level 1** **(50 – 59)%**	**Level 2** **60 - 69%**	**Level 3** **70 - 85%**	**Level 4** **86 - 100%**
Problem definition and project outline	Understands problem, defines it in vague manner and requires support to visualize the direction to move ahead.	Follows the problem theme, tries to explore the ways and conventional options and starts attempting before evaluating various options.	Clear about the problem, visualizes the outcome and follows contemporary approach.	Able to summarize the problem, define problem precisely, devise strategy leading to problem solution and work towards achieving it.

Inquisitiveness and problem solving ability	Able to present synthesis/analysis model but in unacceptable actions.	Able to synthesize/analyse the problem partially with known techniques (limited).	Able to synthesize/analyse the problem with known techniques (limited).	Able to synthesis/analyse the problem and its possible solution and also distinguishes between facts and interferences in the task.
Readiness to receive and evaluate peer's ideas, independent thinking and innovativeness	Receptive and able to weigh concepts/views/ suggestions/opinions offered by faculty. Able to offer limited solution.	Receptive and able to weigh concepts/views/ suggestions/opinions offered by peers and faculty. Able to offer solution and attacks problem with conventional techniques.	Receptive and able to weigh concepts/views/ suggestions/opinions offered by peers, faculty/research works. Able to offer comprehensive alternate approach / solution and attacks problem with conventional techniques.	Receptive and able to weigh concepts/views/ suggestions/opinions offered by peers, faculty/research works. Able to offer comprehensive alternate approach / solution and attacks problem innovatively.
Professionalism, team work and ethics	Unable to execute task in time. Reluctant to accept suggestions.	Able to accomplish and execute the assigned task. Able to criticize the proposed ideas for the assigned task	Able to accomplish and execute the assigned task in time Able to criticize and defend the proposed ideas for the assigned task	Able to accomplish and execute the assigned task in time with adapting the changes. Able to criticize, defend, invite and propose ideas for the assigned task.
Valuing the environment, socio and techno-economical responsibility	Is not aware about environment, socio and techno - economical responsibility nor imbibe these concerns while designing/creating the solution for a given problem	Aware about environment, socio and techno - economical responsibility but does not imbibe these concerns while designing/creating the solution for a given problem	Aware about societal needs, practices environment consciousness but does not imbibe these concerns while designing/creating techno/economica	Aware about societal needs, practices environment consciousness and imbibes these concerns while designing/creating techno/economical solution for the problem.

			l solution for the problem	
Report writing and contribution of work	Poor quality report with lack of contents, without significant conclusions and followed few ethical aspects	Average quality report with required contents; but no significant conclusions and followed desired ethical aspects	Good quality report with desired contents; with significant conclusions and desired ethical aspects	Exceptional report with proper contents and conclusions with desired ethical aspects
Presentation skills	Complaining and Negative attitude; lack of confidence or overconfident	Presentable voice with some positive attitude and sufficient confidence	Presentable voice with good positive attitude and confidence, helpful to others	Exceptional presentation skills with good desired confidence and positive attitude; helping others in presentation