

3. Evaluative Report of the Department

1. Name of the Department
Centre for Non- Conventional Energy Resources
2. Year of establishment
January 2000
3. Is the Department part of a School/Faculty of the university?
Yes, Centre for Non-Conventional Energy Resources is a part of the Faculty of Science
4. Names of programmes offered (UG, PG, M. Phil., Ph.D., Integrated Masters; Integrated Ph.D., D. Sc., D. Litt., etc.):
Center was offering M. Phil and Ph.D. courses in Non- Conventional Energy Resources.
5. Interdisciplinary programmes and departments involved
All science departments including Departments of Physics and Chemistry and faculties from various engineering institutes are involved in the programmes offered by this center.
6. Courses in collaboration with other universities, industries, foreign institutions, etc.
Center is not running any course in collaboration with other universities / institutions/ industries at present.
7. Details of programmes discontinued, if any, with reasons:
The center has discontinued UGC Innovative Project for five years 2007-2012. The M. Phil. course is also discontinued since 2012 due to shortage of staff at this center.
8. Examination System: Annual/Semester/Trimester/Choice Based Credit System
M.Phil. course run by this center had annual system of examination. This course is discontinued since 2012.
9. Participation of the department in the courses offered by other departments:
At present there is no faculty in this Centre.
10. Number of teaching posts sanctioned, filled and actual (Professors/Associate Professors/Asst. Professors/others)
Following is the details of faculty in this department:

| | Sanctioned | Filled | Actual (including CAS & MPS) |
|--|-------------------|---------------|---|
| | | | |

| | | | |
|----------------------|-----|-----|--------|
| Professor | 0 | --- | 0 |
| Associate Professors | 1 | Nil | vacant |
| Asst. Professors | 2 | Nil | vacant |
| Others | --- | --- | --- |

11. Faculty profile with name, qualification, designation, area of specialization, experience and research under guidance

Following is the details of faculty in this department:

| Name | Qualification | Designation | Specialization | No. of Years of Experience | No. of Ph.D./ M. Phil. students guided for the last 4 years |
|------------------------|---------------|--|---------------------------------|----------------------------|---|
| Prof. Ashok K. Nagawat | M.Sc. Ph.D. | Professor & Centre Director | Theoretical High Energy Physics | 33 years | |
| Prof. Kananbala Sharma | M.Sc. Ph.D. | Professor & Ex. Director (Retired in 2015) | Condensed Matter Physics | 33 years | Take from Physics Deptt |
| Prof. D.C. Jain | M.Sc. Ph.D. | Professor & Ex. Director (Retired in 2013) | Condensed Matter Physics | 30 years | |

12. List of senior Visiting Fellows, adjunct faculty, emeritus professors

No senior Visiting Fellows, Adjunct Faculty, Emeritus Professors visited this department during 2009 – 15. However Prof. I P. Jain, Emeritus Professor was involved with this center and was teaching few courses in M. Phil programme run by this center.

13. Percentage of classes taken by temporary faculty programme-wise information

Several of the classes in M. Phil. course were engaged by permanent faculty members of Physics department this university as guest faculty. No class was engaged by any temporary faculty member.

14. Programme-wise Student Teacher Ratio:

Center is not running any teaching programme for the past two years.

15. Number of academic support staff (technical) and administrative staff: sanctioned, filled and actual:

No academic support staff (technical) and administrative staff was sanctioned to this center by the university.

16. Research thrust areas as recognized by major funding agencies:

Following the thrust areas recognized by major funding agencies:

- Hydrogen Energy Storage Materials and Applications
- Solar Energy Materials and Devices
- Material Science Research
- Surface Science: Thin Films, Surfaces and Interfaces
- Ion Beam Mixing at Metal / Silicon interfaces
- Depth Selective Conversion Electron Mössbauer Spectroscopy (DSCEMS).
- Amorphous Semiconductors

17. Number of faculty with ongoing projects from

a) National funding agencies

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b) International funding agencies and

NIL

c) Total grants received.

Amount of grants received during 2009-14: Rs 169.6 lacs

Give the names of the funding agencies, project title and grants received project-wise.

Following are the details of projects received by faculty members of the center:

| S.No. | Title of Project | Name of Agency & Duration | Amount (in Rs. Lacs) Approved & Utilized |
|-------|---|---------------------------|--|
| 1. | Development of LiH & MgH ₂ based alloys with improved Hydrogen storage performance (Emeritus Fellow UGC) | UGC 2011-13 2years | 6.30 |
| 2. | Synthesis & study of Photovoltaic Materials for Thin Film Solar Cells | DST WOS 2011-13 | 6.70 |
| 3. | UGC Innovative Programme in Emerging areas: M. Phil Energy. | UGC 2007-12 | 50.00 |

| | | | |
|-----|---|---------------------------------|-------|
| 4. | Growth and Characterization of Nitride Films for Optoelectronic Device Applications | DST WOS 2011-13 3 years | 17.00 |
| 5. | Emeritus Scientist CSIR Development of new Mg based nano-composites for hydrogen Storage | CSIR-ES 2008-2011 3 years | 18.50 |
| 6. | Track etched polymeric membranes for hydrogen separation and fuel cell applications | DST YSA 2008-11 3 years | 17.60 |
| 7. | SHI induced modification at the surfaces of metal nitride thin films | DST-WOS 2008-11 | 04.50 |
| 8. | Novel Synthetic approaches for the preparation of light metal hydrides and their implementation for hydrogen and energy storage | DST YSA 2008-11 3 years | 20.40 |
| 9. | Hydrogen Content & Depth Profile in metal Hydrides by ERDA | IUAC-UGC 2007-10 | 5.00 |
| 10. | Investigations of hydrogen storage In magnesium and its alloys | UGC 2007-10 | 12.35 |
| 11. | Ion Beam Induced Mixing at Metal/ Si Interfaces and Surfaces | CSIR 2007-10 | 11.25 |

18. Inter-institutional collaborative projects and associated grants received

a) National collaboration

Center has established informal collaboration with Inter University Accelerator Centre (IUAC) New Delhi, UGC-DAE Consortium Indore Centre, Indore, RSIC Panjab University, Chandigarh, CAT, BARC, Indore, NCCMB, BARC, Hyderabad. Under this collaboration, students and faculty members are visiting these centers and using available facilities at these centers.

b) International collaboration:

Center has established informal collaboration with University of Illinois, Urbana Champaign, USA, Hydrogen Research Institute, Universite du Quebec a Trois-Rivieres, Canada, Okinawa Institute of Science and Technology, Okinawa, Japan. Elettra - Sincrotrone Trieste, Trieste, Italy, University of New South Wales, Australia, Institute for Advanced Materials Research, Hiroshima University, Japan, CRNS- Grenoble, France, EMPA Zurich, Switzerland. Under this collaboration, students and faculty members are visiting these centers and using available facilities at these centers.

19. Departmental projects funded by DST-FIST; UGC-SAP/CAS, DPE; DBT, ICSSR, AICTE, etc.; total grants received.

Center has not received any funding under DST-FIST; UGC-SAP/CAS, DPE; DBT, ICSSR, AICTE schemes.

20. Research facility / centre with

- state recognition:
Center has the facility for DSCEMS Technique in UHV
- national recognition
Center is having nationally recognized DSCEMS Technique.
- international recognition
Center is not having any internationally recognized research facility.

21. Special research laboratories sponsored by / created by industry or corporate bodies
NIL

22. Publications:

- * Number of papers published in peer reviewed journals (national/ international)
45
- * Monographs
NIL
- * Chapters in Books
NIL
- * Edited Books
NIL
- * Books with ISBN with details of publishers
NIL
- * Number listed in International Database (For e.g. Web of Science, Scopus, Humanities International Complete, Dare Database - International Social Sciences Directory, EBSCO host, etc.)
As per information available 113 publications are listed in SCOPUS
- * Citation Index – range / average
As per SCOPUS; faculty wise range of citation index is 1 to 1170.
- * SNIP
N.A.
- * SJR
N.A.
- * Impact Factor – range / average:
The range of impact factor is 1-25
- * H-Index:
Maximum h-index as per SCOPUS is 13 (Prof. I.P. Jain)

23. Details of patents and income generated:

No patent has been registered during past five years

24. Areas of consultancy and income generated:

No consultancy services are offered by faculty members during past five years

25. Faculty selected nationally / internationally to visit other laboratories / institutions/ industries in India and abroad.

Prof. I P Jain visited several laboratories / institutions/ industries in India and abroad.

| S. No. | Purpose | Country | Year |
|--------|--|---------|------|
| 1. | International Conference on Hydrogen Production 2015, ICH2P-2015, Oshawa Ontario Canada, May 3- 6, 2015 | Canada | 2015 |
| 2. | 13 th International Conference on Clean Energy “June 8-12, 2014. Istanbul, Turkey | Turkey | 2014 |
| 3. | 18 th World Hydrogen Energy WHEC-2010, May 16-21 in Essen, Germany | Germany | 2010 |
| 4. | Research Collaboration with Science Centre, University of Urbana Champaign, May 17-2 June 2010 US | USA | 2010 |
| 5. | Int. Nat. Conf on Hydrogen Production, University of Ontario Institute of Technology (UOIT) 3-6 May 2009, Oshawa, Canada | Canada | 2009 |
| 6. | PICMET '09 Conference, Technology Management in the Age of Fundamental Change, Aug 2-6, Portland, Oregon, USA | USA | 2009 |

26. Faculty serving in

a) National committees

NIL

b) International committees

NIL

c) Editorial Boards

Prof. I.P. Jain: Guest Editors of an international journal of International Journal of Hydrogen Energy, Vol. 36, 2011

d) any other (please specify):

Prof. I.P. Jain is a member of Science Advisory Committee at IUAC New Delhi

27. Faculty recharging strategies (UGC, ASC, Refresher / orientation programs, workshops, training programs and similar programs).

No recharging programmes were arranged by the center during past five years

28. Student projects:

- percentage of students who have done in-house projects including interdepartmental projects
No student has done any in-house project work for the past two years. Earlier 100% students were doing in-house M.Phil. project work required for their curriculum.
- percentage of students doing projects in collaboration with other universities/ industry / institute
No student has done project work from outside institutes / universities.

29. Awards / recognitions received at the national and international level by

No faculty member or student received any international or national award from this center. However following honours were received by its faculty members and students

- Faculty:
Professor I P Jain
 - Emeritus Scientist: May 2008- Nov2011
 - Emeritus Fellow UGC: Dec 2011-Nov 2013.
- Doctoral / post doctoral fellows:
Following honours were received by doctoral / post-doctoral students of this center:
 - * TRIL PDF Fellowship from ICTP, Trieste, Italy
 - Dr. Garima Agrawal: 2009
 - Dr. Chhagan Lal: 2011, 2012
 - * PDF, Young Scientist Award: DST, New Delhi,
 - Dr. Garima Agarwal 2011
 - * Woman Scientist Award: DST, New Delhi,
 - Dr. Renu Dhunna : 2011
 - Ms Neetu Sharma : 2011
 - * JSPS Post-Doctoral Fellowship, Japan:
 - *Dr. Ankur Jain, 2012-2015*
 - * DST-Max-Planck Visiting Scientist PDF:
 - Dr. Devendra Vyas, 2009,
 - * Indo-Swiss Visiting Fellowship:
 - Dr. Ankur Jain, 2009,
 - * Univ New South Wales, Australia PDF
 - Dr. Renu Dunna, 2011-2015
 - * JSPS PDF, Japan:
 - Dr. Ankur Jain, 2012-2015
 - * OIST, Okinawa, Japan, PDF:
 - Chhagan Lal, 2013
- Students:
NIL

30. Seminars/ Conferences/Workshops organized and the source of funding (national/ international) with details of outstanding participants, if any.

Three conferences / seminars / workshops were organized by the center during past five years. These are:

| Date | Name of the event | Sponsor | Faculty |
|------------------|--|-----------------------------------|---------------------------|
| 17-21 Jan 2011 | International Conference on Renewable Energy, ICRE-2011 | DAE, CSIR, DRDO, INSA, MNRE, ISRO | Prof I P Jain Convener |
| Sept 2009 | International Seminar on Hydrogen Energy: 2009 | Centre for Energy | Prof I P Jain Convener |
| 22-27 March 2009 | Indo French Workshop on Metal Hydride & Applications: 2009 | Indo French Funds | Prof I P Jain Convener |

31. Code of ethics for research followed by the departments:

Code of conducted for research are followed as per UGC and University of Rajasthan norms.

32. Student profile programme-wise

| Name of the Programme | Applications received | Selected | | Pass percentage | |
|-----------------------|-----------------------|----------|--------|-----------------|--------|
| | | Male | Female | Male | Female |
| M.Phil. 2009-10 | - | 16 | - | - | - |
| 2010-11 | | 2 | 6 | | |
| 2011-12 | | 1 | 0 | | |
| Ph.D. 2009-10 | - | 1 | 1 | - | - |
| 2010-11 | | 1 | | | |
| 2011-12 | | | 1 | | |

33. Diversity of students

| Name of the Programme | % of students from the same university | % of students from other universities within the State | % of students from universities outside the State | % of students from other countries |
|-----------------------|--|--|---|------------------------------------|
| M.Phil Ph.D | 100% | - | - | - |

34. How many students have cleared Civil Services and Defense Services examinations, NET, SET, GATE and other competitive examinations? Give details category-wise.

As per available information at this center, no student from this center has cleared Civil Services and Defense Services examinations, NET, SET, GATE and other competitive examinations

35. Student progression

Following is the student's progression:

| Student progression | Percentage against enrolled |
|--|--|
| UG to PG | -- |
| PG to M. Phil. | 22 each : 2007, 2008, 2009 2 : 2011 & 1 : 2012 |
| PG to Ph.D. | 6 : 2009-2014, 2;2015 |
| Ph.D. to Post-Doctoral | 5: 2009-2014, 2- Japan, 1-BHU 1-Australia, 1-Bhavnagar Univ |
| Employed <ul style="list-style-type: none"> • Campus selection • Other than campus recruitment | -- |
| Entrepreneurs | -- |

36. Diversity of staff

Center has no permanent faculty at present.

| Percentage of faculty who are graduates | |
|--|-----|
| of the same university | --- |
| from other universities within the State | --- |
| from universities from other States | --- |
| from universities outside the country | --- |

37. Number of faculty who were awarded M.Phil., Ph.D., D.Sc. and D.Litt. during the assessment period:

| Name of the Candidate | Name of the Supervisor | Date of award |
|--|------------------------|---------------|
| Mr. Chhagan Lal | Prof. I P Jain | 2009 |
| Topic: Solid State mixing at Metal/ Si Interface | | |

38. Present details of departmental infrastructural facilities with regard to

a) Library:

Center has its own Library which houses 181 books, E-Journals are available online through University Network.

b) Internet facilities for staff and students:

43. List the distinguished alumni of the department:

Following alumni of this center has achieved good positions in different organizations:

- Dr. Ankur Jain: Institute for Advanced Materials Research, Hiroshima University, Japan
- Dr. Shivani Agarwal: Institute for Advanced Materials Research, Hiroshima University, Japan
- Dr. Pragya Jain: Universite du Quebec a Trois-Rivieres, Canada
 - Dr. Vaibhav Kulshrestha Scientist, CSIR- Central Salt & Marine Chemical Research Institute, Bhavnagar- Gujrat,

44. Give details of student enrichment programmes (special lectures / workshops /seminar) involving external

Center did not organize any student enrichment programmes as no student was admitted in Centre after 2012.

45. List the teaching methods adopted by the faculty for different programmes.

Faculty members normally adopt blackboard teaching method during their class room teaching. Several times they also apply power point presentation for better understanding. Smart Board was used during 2010-2012 for teaching

46. How does the department ensure that programme objectives are constantly met and learning outcomes are monitored?

Objectives of the Programme are monitored by continuous evaluation and internal assessment in addition to the assessment of the performance of students in End term exams.

47. Highlight the participation of students and faculty in extension activities.

N/A

48. Give details of “beyond syllabus scholarly activities” of the department.

Center organizes Conferences, Seminars, and Workshops for the benefit of students. In the interest of students, it has established research collaboration with National & International institutes.

49. State whether the programme/ department is accredited/ graded by other agencies? If yes, give details.

NO

50. Briefly highlight the contributions of the department in generating new knowledge, basic or applied.

Research work in various fields of renewable energies

- Hydrogen Energy Storage Materials and Applications
- Solar Energy Materials and Devices

51. Detail five major Strengths, Weaknesses, Opportunities and Challenges (SWOC) of the department.

Following are major Strengths, Weaknesses, Opportunities and Challenges of the department:

Strengths

- Center is providing extensive training to its students in specific areas and its students are getting excellent opportunities abroad.

Weaknesses:

- Nil Faculty and Non teaching staff is provided to this center

Opportunities:

- Students have excellent career opportunities in the area of non-conventional energy sources.

Challenges:

- Development of renewable energy sources to make them commercially viable.

52. Future plans of the department

Following are the future plans of this department:

A. Energy Teaching Programme:

We plan to start following teaching in our Centre:

| | |
|-----------------|-------------|
| »» M.Sc. Energy | 10 students |
| »» PG Diploma | 10 students |
| »» Ph.D Energy | 5 students |

Topics of Energy:

»» Hydrogen Energy

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Solar Energy

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Wind Energy

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Bio-Gas

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Geothermal energy

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Mini and Micro Hydel Power

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Batteries

»» Improved Chulha

*

Other Sources of Energy.

1. Hydrogen Energy

Hydrogen gas is now considered to be the most promising fuels of the future. It will provide:

▶▶ Cheap Electricity

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ook Food

*

rive Car

*

un Factories and

▶▶ Jet Planes

▶▶ Hydrogen Village

2. Solar Energy

Solar energy is perennial non-polluting source of energy, which is available in all parts of our country. Various ways in which it can be used as energy are follows:-

a. Solar Photovoltaic/Solar Cells.

▶▶ Photovoltaic, Power Plants

▶▶ Solar Photovoltaic Street Lights

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olar Water Pumping.

b. Solar Thermal Energy

▶▶ Solar Water Heating System

▶▶ Solar Desalination System

▶▶ Solar Cooker

3. Wind Energy:

▶▶ Wind Mill for Water Pumping.

▶▶ Wind forms for Electricity Generation.

4. Bio Gas

▶▶ Family Type Bio Gas Plant for Cooling and Lighting

▶▶ Running Diesel Engine with Bio Gas fuel

5. Bio Energy

▶▶ Thermal Energy Recovery from Waste and Residues

▶▶ Energy recovery from Agricultural, Industrial and Urban waste through Bio –Methanation.

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hermo chemical conversion using gasification and pyrolysis

▶▶ Energy Plantation

6. Mini and Micro Hydel Power

Energy from small hydro is probably the oldest and yet the most reliable of all renewable energy sources.

7. Batteries

Useful as the fuel for surface transportation

8. Improved Chulha

- ▶▶ Mud fixed chulha with or without chimney.
- ▶▶ Portable Metallic chulha

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table Metal Clad ceramic lined chulha

9. Other Sources of Energy

- ▶▶ Magneto Hydro- Dynamics Electricity
- ▶▶ Chemical Sources of Energy
- ▶▶ Human and Animal Energy

All the above sources of energy will from the basic theme of the Energy Centre. The theoretical and experimental teaching will be undertaken at the Centre for the post graduation and research degree.

B. Training Programme

With the help of Energy Park, which we plan to establish with the funds of Ministry of Non Conventional Energy resources, various training programme will be initiated. This will generate awareness among society for Renewable Sources.

C. Energy Park

Energy Park will be established with the funds from State Government and Ministry of Non Conventional Energy Resources

D. Solar Energy Devices for the UNIVERSITY:

In the financial year 2014-2016 following Solar Energy Devices are planned for the University

100 Kw Electricity: @ Rs 3.5 lakh/Kw = Rs. 350 lakhs

Univ. + MNES= 33% + 67% = Rs. 235 + 115 lakh

This will be GRID connected: When not in use by the University, Power can be sold to the State Govt + which in turn reduce equivalent Electricity bill. Such devices will be particularly useful during power cut which is too much during summer time

Steam Cooking: for 500 girls and 500 boys @ 12 lakhs each
With 50 % by MNES

Bio Mass for Cooking: Generate Bio-Energy for all the HOSTELS for use in absence of Sun.

Solar Water Heater: For all the Hostels and Guest House
Capacity: 1000 LPD for 100 girls
Cost: ~ Rs. 30,000/- Per 200 LPD

E. Research in the following fields will be pursued:

1. Hydrogen Energy Storage Materials and Applications.
2. Solar Energy Materials and Devices.
3. Material Science Research:
4. Surface Science: Thin Films, Surfaces and Interfaces
5. Ion Beam Mixing at Metal / Silicon interfaces
6. Depth Selective Conversion Electron Mössbauer Spectroscopy

(DSCEMS)

7. Ultra High Vacuum (UHV) CEMS.
8. Gas Flow Counter (GFC) CEMS.
9. Amorphous Semiconductors

F. Surface Science Projects:

Plans to Have Two Projects:

1. High Resolution Electron Spectroscopy for Chemical Analysis (ESCA) in collaboration with Univ. of Uppsala Sweden.

Prof. Kai Siegbhan, of University of Uppsala, got Nobel Prize for ESCA in 1981, where Dr. I.P.Jain had an opportunity to work:

2. Growth of Metal Nano Structure on Si Surface: Rs. 65 lakhs

G. Hydrogen Energy Projects:

1. Hydrogen Electricity Plant: 10 K Watts: Rs 50 lakhs
2. Project for Hydrogen Run Car: Rs. 10 lakhs.
3. Hydrogen Storage Project: Rs. 30 lakhs

H. Projects for Other Sources of Energy:

Projects in the following Renewable Energies will also be undertaken:

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ind Energy

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io-Gas

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io energy

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atteries