

Proposal for Introduction of Postgraduate Programme in Product Design Engineering

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Changing Landscape.....

- Globalization
 - Borderless business competition
 - Market fragmentation
 - Saturated Markets
- Rapid Technological Breakthroughs
- Information Technology Integration
- Stringent IPR
- Mass-customization
 - Ever changing customer needs
- Demand for original Solutions

■ **Shorter Product Lifecycle**
.....*need to develop capabilities to design and develop new products more rapidly, regularly and more effectively*

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Shorter Product Lifecycle.....

STAGE	RELATIVE COST
Post-release	10,000
Testing	1,000
Tooling	100
Detail design	10
Concept	1

80% of a product's manufacturing cost is determined during the first 20% of its design phase - A British study

..... *entire product lifecycle needs to be visualized at an early stage of the product development process*

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Shifting Focus.....

The graph plots 'Time to Mkt (R&D)', 'Quality', and 'Productivity (production & marketing)' against time. It shows a transition from a 'Drawing' Centric, Task Focus, Serial Design Process in the 80's to an 'IPD' Process, Business Focus, Concurrent Process in the 2000s. The 2000s process is described as Collaborative & Cross-functional team work, leading to an Innovation Economy. IPD stands for Integrated product Development.

.....*need for a more collaborative, intensive, integrated and concurrent product development process*

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Product Development.....

- Product development plays a crucial role in converting new ideas/ inventions into commercially viable products.
- India's aspirations of making a headway into the **innovation economy** hinges in a major way on its industries ability of efficient, effective and rapid product development.
- Increasing pressure on R&D
 - to improve and systemize their methodologies for research, design and development, and the overall process of its innovation.

..... *Product Design Engineering is now spot-lighted as a new technology of the future and a cutting edge discipline*

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Indian Industries....

- **Lack of exposure and expertise** of today's cutting-edge methods and techniques of product design and development.
- Country's large SMEs need
 - redesign, refinement and /or improvement of their products and processes
- creative engineering processes
- **Large pool of indigenous innovations /** traditional knowledge
 - Contemporary applications for local solutions
 - Creating business success at the local level

.... *the proposed programme should cater to the multiple sectors of the industry including the SMEs/NGOs and indigenous innovations, inclusively.*

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Product Design Engineering.....

- A holistic perspective on product development
- A **Systematic Approach** to product development
- Synthesize technology, human need and aesthetics
- Blend innovative problem solving skills with engineering and humanities
- Adopt a humanistic view of technology and its use
- **Ability to coordinate** a multi-disciplinary and cross-functional team

....*focus on the entire process of product realization in a lifecycle-oriented fashion.*

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the Curriculum Document.....

1. Introduction	14. Facilities and strengths of Engineering colleges in India
2. Innovation driven Economy	15. Product Design Engineering and Information Technology
3. Engineering and Design	16. Infrastructure for Product Design Engineering
4. Imperatives of Design	17. Teaching learning Mechanism
5. Scope for Design in India	18. The Department of Product Design Engineering – A Profile
6. National Design Policy	19. Faculty Profile
7. Product Design Engineering: Integrated Product Development	20. Student Profile
8. Product Design Engineering: Globalization, Info. Technology and CAD	21. Profile of a PDE graduate
9. Comparative Analysis of Product Design Engineering Curriculum	22. Prospects for a PDE graduate
10. Conclusions of the Comparative Study	23. Admission Process
11. Product Design Engineering and India	24. Proposed curriculum Course abstracts
12. NID and Design Education	25. Norms of assessment and evaluation (includes course plan and credit system)
13. Autodesk India Pvt. Ltd.	

....*meetings/ visits to Engineering Colleges + professional designers + industry experts*
*study of some of the International Programmes*
*brainstorming workshop*
*NID + Personal Experience*

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the Curriculum Document.....

- Annexure I:** Proposed flow chart for masters degree program
- Annexure II:** Typical course assessment criteria (Jury/exam/viva-voce)
- Annexure III:** List of Books on Product design, Ergonomics and Engineering
- Annexure IV:** Workshop facilities
 1. Hand-tools for wood workshop
Hand tools for paper work
Machine tool and fixtures for wood workshop
 2. Hand tools for metal workshop
Machine tools and fixtures for metal workshop
 3. Measuring instruments
 4. Power tools for workshop
 5. Table Mounted Machines for Workshop
- Annexure V:** Machine for Wood Workshop
- Annexure VI:** Machines for Metal Workshop
Machines for Sheet Metal Workshop
Machines for Plastic Clay & Painting Workshop
CNC and RPD machines
- Annexure VII:** List of Instruments for Ergonomics Laboratory
- Annexure VIII:** Specification and Details for PDE Softwares
- References**

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the Postgraduate Programme in Product Design Engineering....

- Combines the **rigour and precision** of science, technology and engineering with the **inspirational and creative aspects** of design.
 - Exposure to new materials, emerging technologies and processes,
 - Exposure to **group techniques, concurrent engineering** design and styling, management of product development
 - Provide strong practical design skills, a broad technological grounding and extensive knowledge of the innovation process.
 - Exposure to CAD/CAM/CAE based software to develop new products efficiently, quickly and functionally.
 - Concern about the social, cultural and economic impact of design.
- deals with all aspects relevant for the design of a new product, such as function, form, use, production, sales, economics and sustainability*

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the Postgraduate Programme in Product Design Engineering....

- Candidates - Engineering Graduates (from any engg. discipline)
- Programme duration – 2 years, 4 Semester (16 weeks/ semester)
6 weeks Industry Internship + 4 Weeks Design Audit
16 weeks Thesis Project (final Semester)
Total - 74 Week Units, 126 Credits

Courses	weeks
Design	12
Engineering	8
Ergonomics	3.5
Skills	5
Management	2
Humanities	2
Projects	41.5
Total	74

Category	Week Units	Credits
Exploratory	22	32
Theory/ Res./ Enr.	20	30
Specialization	32	64
Total	74	126

....students of multiple engineering disciplines to be brought together to study under a common curriculum pattern which prepares them as innovation experts in the diverse sectors of the engineering industry.

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Teaching – Learning Process....

- Studio based and project based learning, lectures, individual assignments and self-study, interactive classes.
- Industry projects and internships to understand latest technologies and information oriented product making
- To encompass experimentation, theory, creative business and entrepreneurship.
- Qualitative assessment/ feedback system
- Open work culture that encourage peer learning, engage students in creative presentations, discussions, feedback etc.
- The Master's thesis mirrors the fundamental character of the programme, i.e., the integration of engineering design and industrial design.

....structured on a block time method with a balanced integration of both lecture based and project based education

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The Department of Product Design Engineering....

- Sharing the existing facilities, resources and expertise
- Flexible curriculum that promotes academic and professional practice
- Active research, education and interaction with society and industry
- Network with various industry and academic institutes.

- Offer design based elective modules to various disciplines at the UG level
 - Imbibe the spirit of holistic design and innovation in their practice
- Design inputs to the final year students to bring their outcome closer as business proposals
- Encourage trans-disciplinary learning

....a hub of creative explorations to actualize various ideas/ technologies developed at the levels of classroom projects from within the department as well as from other departments of engineering

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Faculty Profile....

- Faculty as an advisor, a facilitator, a mentor
 - help student understand his/her strengths
 - train them to navigate independently to achieve identified goals
- A HoD/ Programme Leader plays a critical role
 - plan inputs from diverse field
 - monitor applications of these inputs into projects,
- Technical inputs from in-house faculty members
- Visiting experts
- Self-development through professional projects, research

- Studio staff to provide active support, guidance and encouragement

....the department initially may begin with one or two full time faculty members

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Infrastructure for PG Programme in PDE....

- Student Workshop
- Digital Design Studio
- Prototyping Workshop
- Advanced Machine Workshop
- Product Testing Lab
- Ergonomics and User Research Lab
- Well equipped Classrooms
- Resource Centre (Literature and materials)

....experimentations, explorations, prototyping, testing as the core of the PDE education

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IT enabled Design Process....

- Concept Exploration
- 3D layout and mechanical system design (concept/principle design)
- Design Modeling (surface modeling and reverse engineering)
- 3D mechanical design (parametric modeling – tooling, plastic mold etc.)
- Engineering simulation
- Design and manufacturing documentation
- Visualization and Communication (real time visualization, photorealistic rendering and animation)
- Productivity: User interface, customization and automation
- Data management, data interoperability and translation with other software
- Ergonomics and software applications.

....utilize the latest computing technology at all stages of the design process. application of digital tools integrated within assignments and projects

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Admission Process....

- Overall Performance of the student at Under-Graduate Engineering degree course.
 - understanding of the fundamentals of engineering
- Attitude test for creativity, worldview and related knowledge.
 - abilities in visualizing and problem solving
- Aptitude test based on "hands on" assignments.
 - understanding of engineering sciences and technology applications
- Personal Interview.
 - awareness of technology business, attitude, interest and passion

....to test students' attitude and aptitude in creative engineering, world view, rigor and maturity to undertake PG level study and a focus on creating an idea into a commercially viable product.

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Prospects for a PDE Graduate....

- Product designer, product engineer, design engineer in the product development process / R&D department.
- Creative engineer, a human factors engineer
- Function as a product manager, customer support manager, quality manager
- *Set up their own design studios*
- Offer Consultancy as freelance design engineering professionals
- A team leader or a project coordinator
- Self starters, Entrepreneurs

.... In the present day Indian economy with its fast-paced growth in the industrial and services sector, graduates in product design engineering have a wide scope for employment or independent practice.

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.... Thank You !!!

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