Masters in Design

Mobility and Vehicle Design

COURSES OF STUDY

IDC, IIT Bombay
M.Des in Mobility and Vehicle Design

While facing a big challenge in terms of changing life style, environmental issue and increasing population density and highly competitive environment, the auto companies are strengthening product development function, including design. International auto majors are setting up design studios in India to meet this challenge. The demand for component design professionals is to grow many folds to man these studios. The programme envisages developing graduates with skill and knowledge, which will make them competent designers for the auto industry in India. Studies include the understanding and identification of the transportation and mobility issue facing the country along with developments in other countries and finding creative solutions. The course covers a broad spectrum from personal to mass transportation. Lectures are supported by hands on exercises and projects.
## Mobility and Vehicle Design Course Content - Semester 1

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### Mobility and Vehicle Design Elective Courses - Semester 1

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## Mobility and Vehicle Design Course Content - Semester 2

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## Mobility and Vehicle Design Course Content - Semester 3

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### Interaction Design Elective Courses - Semester 3

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MD 611
Mobility Design I 1.5 0 2 6

Mobility related research, analysis, vehicle plan & integration

- Understanding context related problems, User research customer’s explicit needs and latent needs.
- Aesthetics, trend, style Analysis
- Product planning, development of product brief. Concept generation, creativity and innovation
- Evaluation techniques. Peer reviews.
- Understanding of the packaging concept and the problems connected with traveling space, technology, ergonomics and aesthetics/ styling.
- Readings and exercises in mobility related topics
- Tasks/small projects related to this topic

Text/ References

- Roozenburg and Eekels, Product Design: Fundamentals and Methods, Publisher: John Wiley & Sons Inc; New Ed edition, 1995
- Cagan, Jonathan; Vogel, Craig M; Creating Breakthrough Products: Innovation from Product Planning to Program Approval, Publisher: Financial Times Prentice Hall; 2002
- Rouse, William B; Design for Success: A Human-Centered Approach to Designing Successful Products and Systems, Publisher: Wiley-Interscience; 1991

MD 612
Automobile Engineering & Technology 1 2 0 6

Vehicle systems, automobile engineering and production Technologies

- Study of systems in a vehicle. Power system: Gasoline, diesel, bio-diesel, electrical, hybrids, solar, wind, compressed air, fuel cell, hydrogen etc.
- Transmission system: clutch, gear trains, differential. Suspension, steering, brakes etc.
- Industrial Fabrics
- Controls: Clutch, gear, dash board display, and automatic control
- Vehicle structure-chassis, mononcoque, pre stressed, sheet metal details & tooling.
- Modern assembly (robotic) and finishing technologies. Production & material logistics
- Integrating technology, aerodynamics, ergonomics, materials, aesthetics and production.
- Readings and seminars. Visit to auto workshops and use of interactive soft wares.

Text/ References

- Julian Happian-Smith; Transport Research Laboratory (TRL) Introduction to Modern Vehicle Design, Publisher: Elsevier, 2001
- Heinz Heisler; Advanced Vehicle Technology, Publisher:Butterworth-Heinemann, 2002
- Seth Leitman, Bob Brant, Leitman Seth; Build Your Own Electric Vehicle: Publisher: McGraw-hill Companies, 2008
MD 613
Presentation Techniques

Presentation of concepts in various media and digital rendering techniques

- Representational Sketching / live drawing—using models and objects
- Perspective - 2 point and 3 point.
- Exploration of different media for rendering—Crayons, pastels, magic markers, combination of media.
- Understanding of lighting techniques through studio photography exercises
- Rendering - opaque, transparent, translucent surfaces, glossy and textured surfaces using colour, shade, shadow, reflection to create realism
- Digital rendering
- Engineering graphics – orthographic (AutoCAD)
- Task: Quick representation of form concepts and ideas, rendering of automobile elements

Text/ References

- Edwards, Betty; New Drawing on the Right Side of the Brain, Publisher: Tarcher; 2002
- Powell, Dick; Design Rendering Techniques: A Guide to Drawing and Presenting Design
- Ideas, Publisher; North Light Books, 1996
- Caplin, Steve; Banks, Adam; The Complete Guide to Digital Illustration, Publisher: Watson-Guptill Publications, 2003
- Demers, Owen; Digital Texturing & Painting, Publisher: New Riders Press; Bk&CD-Rom edition, 2001
- Pogany, Willy; The Art of Drawing, Publisher: Madison Books, 1996
- McKim, Robert; Experiences in Visual Thinking, Publisher: Brooks/Cole Publishing Company, 1980
- Erik Olofsson, Klara Sjolen; Design sketching, publisher: Keeos Design books AB, 2005
- Hanks & Belliston; Rapid Viz, Crisp Publications, INC1990
- Alan Pipes; Drawing for Designers, publisher: Laurence King Publishers, 2007C

MD 614
Mobility Design II

Exploration of sustainable and future mobility solutions

- Pre-requisite: MD 611 – Mobility Design I
- Understanding mobility issues at system level.
- Sustainable mobility – ecology / environment, culture, technology, legislation, safety,
- Mass transportation, Urban, semi-urban, rural transport systems & mobility needs
- Rapid and intelligent transport systems etc.
- Future technologies for mobility
- Tasks: Technology watch, Scenario creation for integrated systems, Strategic approach to mobility design.

Text/ References

- Everly R. Kimes; Pioneers, Engineers, and Scoundrels: The Dawn of the Automobile in America. Publisher: SAE International. 2004
- Frederic Sharf; Future Retro, Publisher: MFA Publications 2005
3d Computer graphics for shape design & modeling

- Use of surface modeling tools to create shapes, volumes and surfaces
- Use of parametric modeling tools
- Creation of complex 3D virtual models complete with surface qualities and rendering
- Digital acquisition—3D scanning, treatment of digital scanned data
- Creation of digital files for rapid prototyping / computer aided milling
- Introduction to studio tools—alias wavefront software for creating virtual models.
- Task: Exercises within the transportation field

Text/References

- Karen E. Goulekas; Visual effects in a digital world. Publisher: Morgan Kaufmann, 2001
- Greiman, A; Hybrid imagery: the fusion of technology and graphic design, architecture, design and technology Press, London, 1990

MD 616
History of Transportation and Automobile Design 1.5 0 2 6

History and evolution of present day of automobile. Styling & branding

- Brief history on the evolution of present day vehicles- Personal and public mobility system
- Development in US, Europe & Japan.
- Indian automobile & mobility scenario
- Innovations in sources of energy and their impact on design.

- Impact of standardization and mass manufacture. Technology and style relationship.
- Retrostyling movement. Automobile terminologies and configurations.
- Tasks: Branding: Retro styling, Styling for future, Exterior and interior design based on themes. Exercises based on the above and seminars.

Text/References

- Beverly Rae Kimes; Pioneers, Engineers & Scoundrels-The dawn of the automobile in America by (SAE) 2004.
- Henry Dominguex; Edsal ford & E.T Gregorie-The remarkable design team and their classic fords of 1930′s 1940′s by 1999 SAE
- Michael W. R. Davis; General Motors: A Photographic History (MI) (Images of Motoring) Publisher: Arcadia Publishing 1999
- Michael Lamm, Dave Holls; A Century of Automotive Style: 100 Years of American Car Design Publisher: Lamm-Morada Pub Co; 2nd edition 1996
- Larry Edsall; Masters of Car Design (Genius) [ILLUSTRATED], Publisher: White Star; illustrated edition 2008.
**MD 617**  
Vehicle Ergonomics  

**Ergonomics of interior spaces, driver/passenger comfort & amenities**

- Introduction to human body.
- Anthropometrics and its application to vehicle ergonomics and cockpit design.
- Driver comfort – seating, visibility, man-machine system.
- Psychological factors – stress, attention
- Passenger comfort - Ingress and egress, spaciousness, ventilation, temperature control, dust and fume prevention and vibration.
- Interior features and conveniences—Use of modern technology for the same.
- Safety issues- active and passive safety features in vehicles.
- Ergonomic research methods / ergonomic audit
- Task: Practical work aimed at integrating design and ergonomics.
- Readings and seminar

**Text/ References**

- B. Peacock, Waldemar Karwowski; Automobile ergonomics. Publisher: CRC; 1 edition, 1993
- S.P. Taylor C.M. Haslegrave; Vision in Vehicles VI. Publisher: North Holland; 1 edition, 1998
- Don Harris (Editor); Engineering Psychology and Cognitive Ergonomics: 8th International conference. Publisher: Springer; 1 edition (2009)

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**MD 618**  
Studies in 3d Form  

**Exploration of form, style and semantics**

- Theory of colors and perception
- Form language for vehicles.
- Form abstraction, form expression, Form transition-use of metaphors.
- Treatment of large surfaces and volumes.
- Interpolation and blending of forms.
- Advanced radii manipulation: Filleting, Chamfers, varying fillets and radii.
- Tangential and non tangential curves.  
- Interior/ Space experience.
- Task: Related to the above topics

**Text/References**

- Wucius Wong; Principles of Two-Dimensional Design, Publisher: Wiley, 1972
- Wucius Wong; Principles of Three-Dimensional Design. Publisher: Van Nostrand Reinhold 1977
- Johannes Itten; Design and Form: The Basic Course at the Bauhaus and Later, Revised Edition, publisher: Wiley; Revised edition, 1975
- Johannes Itten; The Elements of Color. Publisher: Wiley 1970
MD 620
Computer Graphics II  1 1 2 6

Exploration of complex surfaces 
and forms in digital media

• Use of alias wavefront software for 
  the creation of virtual models.
• Use of graphic interface, menu based 
  modeling and rendering.
• Development of form and detail /model with 
  precision, dimension and representational quality.
• 3-D sketch method.
• Merging and stitching of surfaces. Understanding 
  and creating class A, B, C surfaces
• Virtual reality/ animation
• Computer aided creative form exploration.

Text/ References

• Paul Siodmok: About: Computer 
  Aided Design, Design Council Design 
  Council, 8 December 2006.
• Gary R. Bertoline, Eric N. Wiebe, Craig 
  L. Miller, James L. Mohler; Technical Graphics 
  Communication. Publisher:McGraw-Hill 
  Professional, 2002

MD 622
Vehicle Design Process  0 0 4 6

Exposure to vehicle design process 
and systems in auto industry

• Prerequisite MD 613 - Presentation Techniques
• Automobile design process
• Design systems in auto industry
• Project based course

• Project work: Starting from a given ‘preliminary sketch’ of 
  a vehicle concept and taking it through the 
  process of form development using appropriate 
  technologies and iterating at various stages 
  of design to finish with rapid/ CNC model.
• Sketching for style enhancement, selection of concept, 
  2D rendering using CAD tools (adobe Photoshop)
• 3D Modeling. Checking surfaces 
  qualities, Rendering of 3D model.
• Conversion from surface to parametric 
  model (CAID to CAD)
• 2D drawing generation / sectional views / wire diagrams
• Using plaster/ clay for understanding the form and 
  refining, study models

Text/ References

• Tracy Powell; General motors styling 1927- 
  1958: Genesis of the World’s Largest Studios, 
  Publisher: Powell House Publishing , 2007
• Henry L. Domingue; Edsel Ford and E.T. Gregorie: The 
  Remarkable Design Team and Their Classic Fords of 
  the1930s and 1940s.  Publisher: SAE International 1999
• Stephen Newbury; Car Design Yearbook 1: The 
  Definitive Guide to New Concept and Production 
  Cars Worldwide, Publisher: Merrell 2002
• Stephen Newbury Tony Lewin; The Car Design 
  Yearbook 7: The Definitive Annual Guide to All New 
  Concept and Production Cars Worldwide. 2008
MDP 601
Summer Project I (Mid June to mid July) 6

This is a summer project that can be done with an industry, professional design firm, an institution or an organisation like an NGO. The objective of this project is to be part of the process where design is being implemented, contribute towards the process and learn from the situation. The project is meant to expose the student to design practices in his chosen area of interest. This project is expected to influence the degree project in many cases.

MDP 602
Design Project II (Mid July to November end) 18

An independent project with one of the following focus:
• Design project of student interest and/or faculty interest and/or industry project.
• Re-design project that relooks at an existing problem or situation.
• Research project, delving into methodological or pedagogic issues.
• Exploration project, exploring application possibilities in a new technology or medium or variations.

MDP 603
Design Project III, Stage1
(December to February end) 12

This project could be an extension of the previous project (if the scope of the project justifies the extension) or it could be an independent project with one of the following focus:
• Design project of student interest and/or faculty interest and/or industry project.
• Re-design project that relooks at an existing problem or situation.

MDP 604
Design Project III, Stage2
(March to June end) 24

This project will be an extension of the project II and should include development of the final design concept. The defence presentations will be held during the month of April and time given till the end of June to complete the jury feedback, final drawings and finer detailing of the project. The evaluation of the Stage 2 of Project II is done by a panel of examiners appointed by DPGC. The panel will consist of external jury member along with an internal examiner, the guide and the chairman (A Professor or an Associate Professor from another Department of IITBombay).