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

Course Number	Course Name	L	S	ST	Credits
MD 611	Mobility Design I	1.5	0	2	6.0
MD 612	Automobile engineering & Technology	1	2	0	4.0
ID 647	Nature of Materials and Process	1.5	0	2	6.0
ID 649	Studies in Form I	0	0	4	6.0
VC 609	Art, Design and Society I	2	0	0	4.0
	Elective I				6.0
	Elective II				6.0
	Total Credits for Semester I				**38.0**

Mobility and Vehicle Design Elective Courses - Semester 1

Course Number	Course Name	L	S	ST	Credits
VC 603	Image Making and Representation I	0	0	4	6.0
VC 605	Photo Communication	0	0	4	6.0
ID 627	Elements of Design	0	0	4	6.0
ID 629	Media Investigation and Communication Methods	0	0	4	6.0
ID 645	Exposure to Design	0	0	4	6.0
ID 665	Design Workshop I	0	0	4	6.0
AN 609	Life Drawing	0	0	4	6.0
MD 613	Presentation Techniques	0	3	2	6.0
MD 615	Computer Graphics I	1	1	2	6.0

Mobility and Vehicle Design Course Content - Semester 2

Course Number	Course Name	L	S	ST	Credits
MD 616	History of Transportation and automobile design	1.5	0	2	6.0
MD 614	Mobility Design II	1.5	0	2	6.0
MD 618	Studies in 3D Form	1	1	2	6.0
VC 614	Art, Design and Society II	2	0	0	4.0
	Elective III				6.0
	Elective IV				6.0
	Total Credits for Semester II				**34.0**

Mobility and Vehicle Design Elective Course - Semester 2

Course Number	Course Name	L	S	ST	Credits
VC 602	Image Making and Representation II	0	0	4	6.0
VC 604	Digital Video Communication	0	0	4	6.0
VC 618	Information Graphics	0	0	4	6.0
VC 620	Advanced Typography	0	0	4	6.0
VC 624	Designing Interactive Experiences	0	0	4	6.0
VC 626	Story and Narrative	1.5	0	2	6.0
ID 634	Sketching for Designers	0	0	4	6.0
ID 638	Product Interface Design	0	0	4	6.0
IN 604	Usability Evaluation	1.5	0	4	6.0
IN 612	Interactive Medias	0	0	4	6.0
IN 614	Soft Prototyping Techniques	0	0	4	6.0
AN 608	Anatomy and Drawing	0	0	4	6.0
ID 667	Design Workshop II	0	0	4	6.0
MD 620	Computer graphics II	1	1	2	6.0
MD 622	Vehicle Design Process	0	0	4	6.0
	Institute Elective				6.0

Mobility and Vehicle Design Course Content - Semester 3

Course Number	Course Name	L	S	ST	Credits
VC 615	Indian Thoughts and Tradition	2	0	0	4.0
MD 617	Vehicle Ergonomics	1.5	0	2	6.0
MDP 601	Summer Project I (mid May – mid June)				6.0
MDP 602	Design Project II (mid June – end November)				18.0
	Elective V				6.0
	Elective VI				6.0
	Total Credits for Semester III				**46.0**

Interaction Design Elective Courses - Semester 3

Course Number	Course Name	L	S	ST	Credits
VC 627	Advanced Digital Video Communications	0	0	4	6.0
VC 619	Advanced Photography	0	0	4	6.0
VC 635	Studies in Human Computer Interaction	0	0	4	6.0
VC 637	Experimental Animation	0	0	4	6.0
VC 667	Visual Culture	1.5	0	2	6.0
ID 639	Design Management and Professional Practice	1.5	0	2	6.0
ID 653	Product Detailing	0	0	4	6.0
ID 657	Advanced Ergonomics	0	0	4	6.0
ID 659	Product Semantics	0	0	4	6.0
ID 665	Craft, Creativity and Post-Modernism	0	0	4	6.0
ID 673	Design Workshop II	0	0	4	6.0
ID 675	Designing Game for Children	0	0	4	6.0
IN 653	Instructional Design	1.5	0	2	6.0
AN 611	Representation Methods for Animation	0	0	4	6.0
	Institute Elective				6.0

Interaction Design Elective Courses - Semester 4

Course Number	Course Name	L	S	ST	Credits
ID 660	Design Research-Seminar	0	0	4	6.0
MDP 603	Design Project III – Stage 1 (from December 1st – end February)				12.0
MDP 604	Design Project III – Stage 2 (from March – April /June)				24.0
	Total Credits for Semester IV				**42.0**
	Total Credits for M Des. programme in Interaction Design				**160.0**

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

- **Jones, J.C :** Design methods: Seeds of human futures, Wiley interscience, London, 1992.
- **Gorb, Peter,** Ed. Living by Design, Lund Humphries, London 1978.
- **M.M Andereasen,** Integrated Product Development, IFS Publications Ltd. / Springer Verlag, Berlin, 1987.
- **Asimow Morris;** Introduction to Design, Prentice Hall, Englewood Cliffs, N.J., 1962.
- **Pulos, Arthur**, The American Design Ethic, MIT, USA, 1983.
- **Roozenburg and Eekels,** Product Design: Fundamentals and Methods, Publisher: John Wiley & Sons Inc; New Ed edition, 1995
- **Ulrich, Karl T,** Eppinger, Steven D.; Product Design and Development, McGraw-Hill 1995, 2000, 2004
- **Goodrich, Kristina;** Design Secrets: Products: 50 Real-Life Projects Uncovered - Industrial Designers Society of America, Publisher: Rockport Publishers June 2001
- **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 dynamics. Aerodynamics of vehicles.
- 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 **0 3 2 6**

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 **1.5 0 2 6**

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
- **Tracy Powell;** General Motors Styling 1927-1958: Genesis of the World's Largest Design Studios.Publisher: Powell House 2007
- **David Temple;** GM's Motorama: The Glamorous Show Cars of a Cultural Phenomenon. Publisher: Motorbooks; 1st edition, 2006
- **Frederic Sharf;** Future Retro, Publisher: MFA Publications 2005

MD 615
Computer Graphics I **1 1 2 6**

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.
- **L. J. K Setrigh;** The designers: Great automobiles and the men who made them. Publisher: Follett Pub. Co 1976

MD 617
Vehicle Ergonomics 1.5 0 2 6

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
- **Cristy ho, Charles Spenser;** The multi-sensory drives: Implication for ergonomics car interface design. Publisher CRC press 1993.
- **Don Harris (Editor);** Engineering Psychology and Cognitive Ergonomics: 8th International conference. Publisher: Springer; 1 edition (2009)

MD 618
Studies in 3D Form 1 1 2 6

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
- **Stephen Luecking;** Principles of Three-Dimensional Design: Objects, Space and Meaning. Publisher: Prentice Hall, 2002.
- **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 re looks 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.
- Research project, delving into methodological or pedagogic issues.
- Exploration project, exploring application possibilities in a new technology or medium or variations.
- The evaluation of the Stage 1 of Project II is done internally with a panel appointed by the DPGC in consultation with the guide. The panel will consist of the guide and two other faculty members.

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)