ACADEMIC AFFAIRS OFFICE
INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

No. Acd./2304 /IAPC-113 Dated: December 24, 2021

Head, Department of Design

The IAPC in its 113th meeting held on 24.11.2021 vide Item No. 113.2.6 (2) considered and approved the syllabi of PCCs/ PECs of M.Des. and MIM programs of Department of Design with modifications.

The modified syllabi are attached as **Appendix-A**.

Assistant Registrar (Curriculum)

Encl: as above

Copy to (through e mail):-

1. All faculty
2. Head of all Departments / Centres
3. Dean, Academic Affairs
4. Associate Dean of Academic Affairs (Curriculum)
5. Channel i/ Acad portal/ Academic webpage of iitr.ac.in

INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

NAME OF DEPARTMENT/CENTRE: Department of Design

1. **Subject Code:** IDN-546 **Course Title**: Product Design
2. **Contact Hours:** **L:** 3 **T:** 0 **P:** 0
3. **Examination Duration (Hrs.):** **Theory:** 3 **Practical:** 0
4. **Relative Weightage:** **CWS:** 20-35 **PRS:** 0 **MTE:** 20-30 **ETE:** 40-50 **PRE:** 0
5. **Credits:** 3 **6. Semester:** Autumn **7. Subject Area:** PEC
8. **Pre-requisite:** Nil
9. **Objective:** To acquaint the students with the practical knowledge regarding conceptualization, design and development of a new product.

10. Details of the Course

S.No.	Contents	Contact hours
1.	**Introduction:** Product life cycle, Product policy of an organization. Selection of a profitable product, Product design process, Product analysis	8
2.	**Functional Analysis:** Value engineering in product design; Advantages, Applications in product design, Problem identification and selection, Analysis of functions, Anatomy of function. Primary versus secondary versus tertiary/unnecessary functions, Functional analysis: Functional Analysis System Technique (FAST), Case studies	9
3.	**Product Design Tools and Guidelines:** Introduction to product design tools, Quality Function Deployment (QFD), Computer Aided Design, Robust design, Design for Excellence (DFX), Design for Manufacturing (DFM), Design for Assembly (DFA), Ergonomics in product design, Design for Manufacturing and Assembly (DFMA) guidelines, Product design for manual assembly	9
4.	**Basic Product Design Guidelines for various Manufacturing Processes:** Design guidelines for metallic and non-metallic products to be manufactured by different processes such as casting, machining, injection molding etc.	8
5.	**Rapid Prototyping:** Rapid prototyping, needs, advantages, working principle of Stereolithography Apparatus (SLA), Laminated Object Manufacturing (LOM) and Selective Laser Sintering (SLS)	8
Total		**42**

11. Suggested Books:

S.No.	Name of Authors/Book/Publisher	Year of Publication / Reprint
1.	Boothroyd G., Dewhurst P., and Knight, "Product Design for Manufacture and Assembly", 2nd Ed., Marcel Dekker.	2002
2.	Mortenson, M. E., "Geometric Modelling", 3rd Ed., Industrial Press	2006
3.	Andreasen, M.M., Kahler, S., Lund, T., and Swift, K., "Design for Assembly", Springer Verlag	1988
4.	Wang, B., "Integrated Product, Process and Enterprise Design", Chapman & Hall, 1997	1997

INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

NAME OF DEPARTMENT/CENTRE: Department of Design

2. **Subject Code:** IDN-522 **Course Title**: Computer Aided Design

1. **Contact Hours:** **L:** 2 **T:** 0 **P:** 2

2. **Examination Duration (Hrs.):** **Theory:** 2 **Practical:** 0

3. **Relative Weightage:** **CWS:** 10-25 **PRS:** 25 **MTE:** 15-25 **ETE:** 30-40 **PRE:** 0

4. **Credits:** 3 **6. Semester:** Autumn **7. Subject Area:** PEC

8. **Pre-requisite:** Nil

9. **Objective:** To get exposure about basic modelling of curves, surface, solid, scanning, rendering, animation etc.

10. **Details of the Course**

S.No.	Contents	Contact hours
1.	Introduction: History of CAD, Product lifecycle, Role of CAD in Industrial Design Modeling. Introduction to modeling tools	3
2.	Modeling of curves, surfaces and solids, Representation of curve and surfaces Manipulation of CAD models, Parametric Curves, Tangent, Normal, Curvature, Continuity, Bezier curve, B-Spline curves, and surfaces.	6
3.	Wireframe Models, Solid Models, Solid Representations, Regularized Boolean Operators, Constructive Solid Geometry (CSG), Boundary representation.	4
4.	Feature-based modeling, parametric/variational modeling, product data exchange standards; Various CAD data formats	4
5.	Introduction to Computer Aided Industrial Design (CAID); Interfacing for production and tool design	5
6.	Photo rendering and scanning, 3D animation and morphing, studio exercise in virtual products and systems. Hands on project.	6
Total		**28**

11. **Suggested Books:**

S.No.	Name of Authors/Book/Publisher	Year of Publication / Reprint
1.	Zeid I., “CAD/CAM: Theory and Practice”, Tata McGraw Hill	1998
2.	Martti Mantyla, An Introduction to Solid Modelling, Computer Science Press	1988
3.	Les Piegl and Wayne Tiller, The Nurbs Book, Springer-Verlag Heidelberg	1995
4.	R.W. Gill, Manual of Rendering with Pen and Ink, Thames and Hudson	1997

12. List of Practicals:

S.No.	Practicals	Hours
1.	Modelling styling features of a product	4
2.	Curved surface creation using primitive tools	4
3.	Curved Surface Creation using advanced tools such as Surface modelling	4
4.	Assembly Modelling using standard constraints	4
5.	Assembly creation using planes as only constrains	2
6.	To make a fully constrained drawing using sketch command	2
7.	To create a complex 3D structure using primitive 3D structures	2
8.	To create a 3D model using advance tools such as sweep, loft, revolve, pattern	2

INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

NAME OF DEPARTMENT/CENTRE: Department of Design

1. **Subject Code:** IDN-523 **Course Title**: Rapid Prototyping
2. **Contact Hours:** **L:** 2 **T:** 0 **P:** 2
3. **Examination Duration (Hrs.):** **Theory:** 2 **Practical:** 0
4. **Relative Weightage:** **CWS:** 10-25 **PRS:** 25 **MTE:** 15-25 **ETE:** 30-40 **PRE:** 0
5. **Credits:** 3 **6. Semester:** Autumn **7. Subject Area:** PEC
8. **Pre-requisite:** Nil
9. **Objective:** To introduce students with concepts of Rapid Prototyping and different techniques for developing prototypes.

10. Details of the Course

S.No.	Contents	Contact hours
1.	**Introduction:** Rapid Prototyping (RP), Traditional manufacturing vs RP, history, fundamentals of RP, process physics, RP process chain, Applications of RP.	5
2.	**Liquid based RP methods:** process mechanism, product design guide lines, applications, advantages and limitations of the techniques – Stereolithography (SLA), solid ground curing (SGC), solid creation system (SCS).	6
3.	**Solid based RP methods:** process mechanism, product design guide lines, applications, advantages and limitations of the techniques – fused deposition modeling (FDM), laminated object manufacturing (LOM), and extrusion based fused.	6
4.	**Powder based RP methods:** process mechanism, product design guide lines, applications, advantages and limitations of the techniques – selective laser sintering (SLS), 3D printing (3DP), ballistic particle manufacturing (BPM), shaping, and electron beam melting.	6
5.	**Application of RP:** Selection of RP technologies using decision methods, Additive manufacturing process plan: strategies and post processing, Monitoring and control of defects	5
Total		**28**

11. Suggested Books:

S.No.	Name of Authors/Book/Publisher	Year of Publication / Reprint
1.	I. Gibson, D. W. Rosen, B. Stucker, 'Additive manufacturing technologies: rapid prototyping to direct digital manufacturing', Springer.	2010
2.	A. Gebhardt, 'Understanding additive manufacturing: rapid prototyping, rapid tooling, rapid manufacturing', Hanser Publishers.	2011
3.	J. D. Majumdar and I. Manna, 'Laser-assisted fabrication of materials', Springer Series in Material Science.	2013
4.	L. Lu, J. Fuh and Y.-S. Wong, Laser-induced materials and processes for rapid prototyping, Kluwer Academic Press.	2001

12. List of Practicals:

S.No.	Practicals	Hours
1.	To fabricate a ABS part using the Fused Deposition Modeling process	4
2.	To fabricate a component using Stereolithography Apparatus	4
3.	To fabricate a component using powder-based RP process	4
4.	Study and demonstration of post-curing process for RP parts	4
5.	Group Project	12

INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

NAME OF DEPARTMENT/CENTRE: Department of Design

1. **Subject Code:** IDN-525 **Course Title**: CAE in Product Design
2. **Contact Hours:** **L:** 3 **T:** 0 **P:** 0
3. **Examination Duration (Hrs.):** **Theory:** 3 **Practical:** 0
4. **Relative Weightage:** **CWS:** 20-35 **PRS:** 0 **MTE:** 20-30 **ETE:** 40-50 **PRE:** 0
5. **Credits:** 3 **6. Semester:** Spring **7. Subject Area:** PEC
8. **Pre-requisite:** Nil
9. **Objective:** To get exposure about basic modeling of curves, surface, solid, scanning, rendering, animation etc.

10. **Details of the Course**

S.No.	Contents	Contact hours
1.	Product development driven by concurrent engineering	4
2.	Role of Computer-Aided Engineering (CAE) in product design	4
3.	Mathematical abstractions of products for functionality verification; lumped mass, finite element, boundary element, and statistical modeling procedures	12
4.	Use of commercial finite element-based packages for design analysis and optimization.	8
Total		**28**

11. **Suggested Books:**

S.No.	Name of Authors/Book/Publisher	Year of Publication / Reprint
1.	Bathe, K.J., Finite Element Procedures, Prentice Hall	1995
2.	Robert Cook, Finite Element Modeling for Stress Analysis, John Wiley & Sons, INC	1995
3.	Banerjee, P.K. and Butterfield R., Boundary Element Methods in Engineering Science, McGraw Hill	1981

INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

NAME OF DEPARTMENT/CENTRE: Department of Design

1. **Subject Code:** IDN-526 **Course Title**: Reverse Engineering
2. **Contact Hours:** **L:** 2 **T:** 0 **P:** 2
3. **Examination Duration (Hrs.):** **Theory:** 2 **Practical:** 0
4. **Relative Weightage:** **CWS:** 10-25 **PRS:** 25 **MTE:** 15-25 **ETE:** 30-40 **PRE:** 0
5. **Credits:** 3 **6. Semester:** Spring **7. Subject Area:** PEC
8. **Pre-requisite:** Nil
9. **Objective:** To introduce students with the concepts of reverse engineering and enable them to identify the suitable mechanisms and materials for manufacturing of an object.

10. Details of the Course

S.No.	Contents	Contact hours
1.	**Introduction:** scope and tasks of Reverse Engineering (RE), fundamentals and use of RE as a generic process, phases of RE (scanning, point processing, and geometric model development.	7
2.	**Methodologies and techniques:** Object Scanning: types of scanners, destructive methods, coordinate measuring machine, Point data Processing: processing and post-processing of captured data, geometric model development, construction of surface model, solid model, noise reduction, feature identification and model verification	15
3.	**Rapid Prototyping:** fundamentals of RP and different techniques of RP	3
4.	**Legal aspects of RE:** introduction and copyright law	3
Total		**28**

11. Suggested Books:

S.No.	Name of Authors/Book/Publisher	Year of Publication / Reprint
1.	K. A. Ingle, 'Reverse Engineering', McGraw-Hill	1994
2.	T. J. Biggerstaff, 'Design recovery of Maintenance and Reuse', IEEE Corporation	1991
3.	A. Peter, 'Data Reverse Engineering', McGraw-Hill	1996
4.	V. Raja and K. Fernandes, 'Reverse Engineering: An Industrial Perspective', Springer Verlag.	2008

12. List of Practicals:

S.No.	Practicals	Hours
1.	To perform reverse engineering of a component using CMM	4
2.	To perform reverse engineering of a component using 3-D scanner	4
3.	To create indirect rapid tooling for casting process	4
4.	Group Project	12

INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

NAME OF DEPARTMENT/CENTRE: Department of Design

1. **Subject Code:** IDN-547 **Course Title**: Manufacturing Guidelines for Product Design
2. **Contact Hours:** **L:** 3 **T:** 0 **P:** 0
3. **Examination Duration (Hrs.):** **Theory:** 3 **Practical:** 0
4. **Relative Weightage:** **CWS:** 20-35 **PRS:** 0 **MTE:** 20-30 **ETE:** 40-50 **PRE:** 0
5. **Credits:** 3 **6. Semester:** Autumn **7. Subject Area:** PEC
8. **Pre-requisite:** Nil
9. **Objective:** To instil the concept of design thinking that involves an integrated approach of combining the functions of design and manufacturing (including assembly).

10. **Details of the Course**

S.No.	Contents	Contact hours
1.	**Introduction:** Product Design: Basics, Introduction of Manufacturing Processes, Manufacturing Processes Advantages and Limitations-I, Manufacturing Processes Advantages and Limitations-II, Process Capabilities: Basics	8
2.	**Selection of Materials and Processes:** Engineering Materials, Properties of Materials, Selection of Materials – I, Selection of Materials – II, Applications of Engineering Material, Selection of Processes-I, Selection of Processes-II, Process Capabilities, Design Guidelines for Sand Casting, Design Guidelines for Die Casting Process	8
3.	**Design Guidelines for Primary Processing:** Product Design Guidelines: Compression Molding and Extrusion, Design Guidelines for Extrusion and Injection Molding, Design Guidelines for Sheet Metal Working, Design Guidelines for Machining, Design Guidelines for Powder Metal Processing	9
4.	**Design Guidelines for Secondary Processing:** Assembly Processes: Introduction, Adhesive Joining: Guidelines, Design Guidelines for Mechanical Fasteners, Design Guidelines for Welding, Design Guidelines: Brazing and Soldering, Induction Welding: Plastics, Ultrasonic Welding: Plastics, Vibration and Spin Welding: Plastics, Microwave Joining, Hole Making in Polymer and Polymer Matrix Composites	9
5.	**Concepts of Design:** Robust Design, Design for X, Product Design for Manual Assembly, DFMA Guidelines, Ergonomics in Product Design, Design for Environment, Design for Environment Process, Product Architecture, Rapid Prototyping, Product Design - Manufacturing Perspective	8
Total		**42**

11. Suggested Books:

S.No.	Name of Authors/Book/Publisher	Year of Publication / Reprint
1.	Boothroyd G., Dewhurst P., and Knight W., "Product Design for Manufacture and Assembly", 2nd Edition, Marcel Dekker.	2002
2.	Bralla J. G., "Design for Manufacturability Handbook", 4th edition, McGraw Hill.	1998
3.	Huang G. Q., "Design for X: Concurrent Engineering Imperatives", Chapman & Hall	1996
4.	Kusiak A., "Concurrent Engineering: Automation, Tools, and Techniques", Wiley	1993

INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

NAME OF DEPARTMENT/CENTRE: Department of Design

1. **Subject Code:** IDN-528 **Course Title**: Product Planning and Marketing
2. **Contact Hours:** **L:** 3 **T:** 0 **P:** 0
3. **Examination Duration (Hrs.):** **Theory:** 3 **Practical:** 0
4. **Relative Weightage:** **CWS:** 20-35 **PRS:** 0 **MTE:** 20-30 **ETE:** 40-50 **PRE:** 0
5. **Credits:** 3 **6. Semester:** Autumn **7. Subject Area:** PEC
8. **Pre-requisite:** Nil
9. **Objective:** To learn and reflect on the marketing process and product planning with reference to brand equity measurement.

10. Details of the Course

S.No.	Contents	Contact hours
1.	Corporate strategy for product planning	3
2.	Introduction to marketing, new strategies, market identification, segmentation and entry, strategies.	4
3.	Consumer response measurement, perceptual mapping, brand equity, strategic product positioning.	7
4.	Estimation of sales potential, product launching and product life cycle	4
5.	Advertising basics, services and processes	5
6.	Fundamentals of consumer behaviour	5
Total		**28**

11. Suggested Books:

S.No.	Name of Authors/Book/Publisher	Year of Publication / Reprint
1.	Philip Kotler and K. L. Keven Lane Keller, Marketing Management, Pearson	2016
2.	C. Merle Crawford, C. Anthony Di Benedetto, New Products Management, McGraw-Hill/Irwin	2006
3.	Luck David J., Rubin Ronald S., Marketing Research, Prentice Hall	1987
4.	Schiffman & Kanuk, Consumer Behavior, Pearson	2000

INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

NAME OF DEPARTMENT/CENTRE: Department of Design

1. **Subject Code:** IDN-530 **Course Title**: Business and Service Innovation
2. **Contact Hours:** **L:** 3 **T:** 0 **P:** 0
3. **Examination Duration (Hrs.):** **Theory:** 3 **Practical:** 0
4. **Relative Weightage:** **CWS:** 20-35 **PRS:** 0 **MTE:** 20-30 **ETE:** 40-50 **PRE:** 0
5. **Credits:** 3 **6. Semester:** Spring **7. Subject Area:** PEC
8. **Pre-requisite:** Nil
9. **Objective:** To enable students to identify, implement and evaluate innovative service offerings and business models.
10. **Details of the Course**

S.No.	Contents	Contact hours
1.	Service Economy and Service Organizations, Role of services in manufacturing firms, recent trends in manufacturing	4
2.	Developing a service strategy, service positioning and implications for service delivery design, degree of customer contact, divergence, customization; Service blue printing	3
3.	Product, Technology, Process and People-centric Services, Technical View of Services: Techniques for Service Analysis, Work System Method, Service Value Networks	5
4.	Business Models, Components of the business model, Business Model Canvas, Various types of Business Models, Generating New Business Model Ideas, Ideation Process, Visual Thinking, Different Types of Visualization.	8
5.	The value proposition, Elements of intangibles, Value creation through intellectual resources	8
6.	Business Model Design Process Design Attitude five phases (Mobilize, Understand, Design, Implement, and Manage) Prototyping, Prototypes at Different Scales	8
7.	Storytelling, Developing the Story, Making Business Models Tangible, Scenario-Guided Business Model Design	2
8.	Evaluating business models, business model perspective on blue ocean strategy, blending the blue ocean strategy framework with the business model canvas Managing multiple business models, Implementing Business Models in Organizations, Aligning IT with Business	4
Total		**42**

11. Suggested Books:

S.No.	Name of Authors/Book/Publisher	Year of Publication / Reprint
1.	Schultz, M and Doerr, J., "Professional services Marketing", Wiley,	2009
2.	Lovelock, C., and Wirtz, J, "Essentials of Services Marketing", Pearson Education	2008
3.	Alexander Osterwalder and Yves Pigneur, "Business Model Generation: A Handbook for Visionaries, Game Changers, and Challengers", Wiley	2010
4.	Adam J. Bock and Gerard George "The Business Model Book: Design, Build and Adapt Business Ideas that Drive Business Growth", Pearson Education Limited	2017
5.	Raphael Amit and Christoph Zott, Business Model Innovation Strategy: Transformational Concepts and Tools for Entrepreneurial Leaders", Wiley	2020

INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

NAME OF DEPARTMENT/CENTRE: Department of Design

1. **Subject Code:** IDN-531 **Course Title**: Legal Standards/IPR
2. **Contact Hours:** **L:** 3 **T:** 0 **P:** 0
3. **Examination Duration (Hrs.):** **Theory:** 3 **Practical:** 0
4. **Relative Weightage:** **CWS:** 20-35 **PRS:** 0 **MTE:** 20-30 **ETE:** 40-50 **PRE:** 0
5. **Credits:** 3 **6. Semester:** Autumn **7. Subject Area:** PEC
8. **Pre-requisite:** Nil
9. **Objective:** To impart knowledge of the various legal aspects including IPR to protect the designs and innovations.
10. **Details of the Course**

S.No.	Contents	Contact hours
1.	Introduction: Meaning, Relevance, Business Impact, Protection of Intellectual Property Copyrights, Trademarks, Patents, Designs, Utility Models, Trade Secrets and Geographical Indications Bio-diversity and IPR. Competing Rationales for Protection of Intellectual Property Rights	6
2.	Introduction to the leading International Instruments concerning Intellectual Property Rights: The Berne Convention, Universal Copyright Convention, The Paris Convention, Patent Co-operation Treaty, TRIPS, The World Intellectual Property Organization (WIPO) and the UNESCO	6
3.	Concept of Patent- Product / Process Patents & Terminology, Patents- Law and Policy Consideration Elements of Patentability, - Novelty and Non Obviousness (Inventive Steps and Industrial Application, Non- Patentable Subject Matter, Procedure for Filing of Patent Application and types of Applications, Procedure for Opposition, Revocation of Patents, Ownership and Maintenance of Patents, Assignment and licensing of Patents	8
4.	Patent Infringement, Literal Infringement, Contributory Infringement, Defenses to Infringement including Experimental Use, Inequitable Conduct, Patent Misuse, Legal Aspects (Act, Rules, Procedures), Case Study	7
5.	Recent Developments in Patent System, Software and Business Method Patenting in India & other Jurisdiction, Patentable Inventions with Special Reference to Biotechnology Products entailing Creation of New Forms of Life.	7
6.	Key Business Concerns in Commercializing Intellectual Property Rights, Competition and Confidentiality Issues, Antitrust Laws, Assignment of Intellectual Property Rights, Technology Transfer Agreements, Intellectual Property Issues in the Sale of Business, Care & Maintenance of Confidential Information, Legal Auditing of Intellectual Property, Due Diligence of Intellectual Property Rights in a Corporate Transaction	8
Total		**42**

11. Suggested Books:

S.No.	Name of Authors/Book/Publisher	Year of Publication / Reprint
1.	Nithyananda, K V. Intellectual Property Rights: Protection and Management, Cengage Learning India Private Limited.	2019
2.	Neeraj, P., & Khusdeep, D. Intellectual Property Rights, PHI learning Private Limited.	2014
3.	Geoffrey A. Manne, Joshua D. Wright, Competition Policy and Patent Law under uncertainty, regulating innovation, publisher Cambridge University Press	2011
4.	Audrea Stazi, Biotechnological Inventions and patentability of life, the US and European Experience publisher Edward Elgar Publishing Limited	2015
5.	Prasad Karhad, How to patent an Idea in India, from idea to granted patent in quickest time, saving costs and making money with your patented invention, Intellectual Property in India	2018

INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

NAME OF DEPARTMENT/CENTRE: Department of Design

1. **Subject Code:** IDN-532 **Course Title**: Systems Thinking
2. **Contact Hours:** **L:** 3 **T:** 0 **P:** 0
3. **Examination Duration (Hrs.):** **Theory:** 3 **Practical:** 0
4. **Relative Weightage:** **CWS:** 20-35 **PRS:** 0 **MTE:** 20-30 **ETE:** 40-50 **PRE:** 0
5. **Credits:** 3 **6. Semester:** Autumn **7. Subject Area:** PEC
8. **Pre-requisite:** Nil
9. **Objective:** The objective of this course is to understand system dynamics and its applications in innovative business models.

10. Details of the Course

S.No.	Contents	Contact hours
1.	Introduction to System thinking, System thinking in various disciplines such as Philosophy, the life sciences, social sciences and business.	7
2.	System Dynamics, Applications of system dynamics. The modeling process. The client and the modeler, Steps and overview of modeling process.	7
3.	Structure and behavior of dynamic systems, Fundamental modes of dynamic behavior, S-shaped growth, Overshoot and Collapse, Equilibrium, Randomness and Chaos.	9
4.	Tools for system thinking, Casual loop diagrams. Adam Smith's invisible hand and the feedback structure of the market, policy resistance.	6
5.	Stock flows and accumulation, identifying and mapping stocks and flows, dynamics of stocks and flows.	6
6.	Dynamics of simple structure, dynamics of growth, epidemics, innovation diffusion, and the growth of new product	7
Total		**42**

11. Suggested Books:

S.No.	Name of Authors/Book/Publisher	Year of Publication / Reprint
1.	John D. Sterman, Business Dynamics: System Thinking and Modeling for a complex world, McGraw Hill Education.	2018
2.	Donella Meadows, Thinking in Systems: A Primer, Published by Earthscan.	2015
3.	Michael C. Jackson, Critical System Thinking and the Management of Complexity: Responsible Leadership for a Complex World, Wiley.	2019
4.	David Peter Stroh, Systems Thinking For Social Change, Chelsea Green Publishing Co	2015

INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

NAME OF DEPARTMENT/CENTRE: Department of Design

1. **Subject Code:** IDN-534 **Course Title**: Interaction Design
2. **Contact Hours:** **L:** 2 **T:** 0 **P:** 2
3. **Examination Duration (Hrs.):** **Theory:** 2 **Practical:** 0
4. **Relative Weightage:** **CWS:** 10-25 **PRS:** 25 **MTE:** 15-25 **ETE:** 30-40 **PRE:** 0
5. **Credits:** 3 **6. Semester:** Spring **7. Subject Area:** PEC
8. **Pre-requisite:** Nil
9. **Objective:** To impart knowledge on the different aspects of Human Computer Interaction Design.
10. **Details of the Course**

S.No.	Contents	Contact hours
1.	Introduction to Human Computer Interaction Design; Brief History of Interaction Design.	6
2.	Interaction Design Methodology; Low fidelity Paper prototype, Wire framing.	8
3.	Information Architecture, GUI, Design Testing.	8
4.	Case studies and best practices	6
Total		**28**

11. **Suggested Books:**

S.No.	Name of Authors/Book/Publisher	Year of Publication / Reprint
1.	Krug, S. – "Don't Make Me Think", Rider publication.	2006
2.	Jakob Nielsen – "Designing Web Usability: The Practice of Simplicity", New Riders Publishing	1999
3.	Lidwell, W., Holden, K. and Butler, J. – "Universal Principles of Design", Rockport Publishers.	2010
4.	Manovich, L. – "The Language of New Media", MIT Press	2001

12. **List of Practicals:**

S.No.	Practicals	Hours
1.	Designing a mobile application/game	10
2.	Designing a website	10
3.	Visual design of UI components	8

INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

NAME OF DEPARTMENT/CENTRE: Department of Design

1. **Subject Code:** IDN-548 **Course Title**: Inter-Disciplinary Design
2. **Contact Hours:** **L:** 2 **T:** 0 **P:** 2/2
3. **Examination Duration (Hrs.):** **Theory:** 2 **Practical:** 0
4. **Relative Weightage:** **CWS:** 15-30 **PRS:** 20 **MTE:** 15-25 **ETE:** 30-40 **PRE:** 0
5. **Credits:** 3 **6. Semester:** Spring **7. Subject Area:** PEC
8. **Pre-requisite:** Nil
9. **Objective:** To equip students to generate experimental ideas and designs through cross-disciplinary explorations, and to develop creative practices that address emerging and complex challenges; collaborating with stakeholders; imagining futures that can serve as effective interventions; considering issues from multiple perspectives and scales.

10. **Details of the Course**

S.No.	Contents	Contact hours
1.	Bio-Inspired Design: Introduction to Bio Inspired Design; Nature as mentor and source of inspiration; variety of biomimetic methods; systems organisation; hierarchical structures; materials; structure, surface and skin; decomposing objects and deciphering forms; applications	5
2.	Mobility Design: History of transportation and automobile design; basics of mobility design and ergonomics; materials and finishes; vehicle sketching and representation; vehicle styling and packaging; prototyping; future mobility; innovations; applications	5
3.	Culture, Curation and Narrative Design: visual and cultural narratives; social, cultural, historical, technical, and political contexts of design; digital curation and story-telling; design semantics; design-focused museums; design exhibitions; case studies; applications	5
4.	Craft-Design: introduction to craft and skills; material, maker and making; craft-design process; craft-based design for innovation; craft-design collaborations; creative and cultural industries; communities; co-creation; applications	5
5.	Interdisciplinary Design: creative design processes driven by cross-pollination and interdisciplinary exchange amongst the above mentioned paradigms of design; shared knowledge; experimental design; knowledge creation and transfer through interdisciplinary design interventions; case studies; applications	8
Total		**28**

11. Suggested Books:

S.No.	Name of Authors/Book/Publisher	Year of Publication / Reprint
1.	Sandy B. Primrose. Biomimetics: Nature-Inspired Design and Innovation, Wiley-Blackwell; 1st edition	2020
2.	Helena Hashemi Farzaneh, Udo Lindemann. A Practical Guide to Bio-inspired Design, Springer Vieweg	2019
3.	Mike Tovey, Andree Woodcock, Jane Osmond. Designing Mobility and Transport Services, Routledge, 1st edition	2020
4.	Selby Coxon, Robbie Napper, Mark Richardson. Urban Mobility Design, Elsevier, 1st Edition	2018
5.	Rebecca Reubens. Holistic Sustainability Through Craft-Design Collaboration, Routledge, 1st Edition	2020

12. Suggested Exercise:

- Select and study in detail, an organism found in nature. Translate the investigation and understanding in the design of a product/ graphic/ environment.
- Highlight and discuss diverse craft forms and communities through a selected case. Investigate the collaborative and experimental craft-design processes; value addition they bring forth; present the findings; create new prototypes
- Study visual, cultural and oral narratives; investigate and understand the inter-relationships with design; develop storyboards/ project branding and identity/ narrative environments for curation etc.
- Study and investigate varied aspects of mobility design; and develop prototypes
- Cross pollination amongst any two paradigms, listed above, and develop a project focusing on trans-disciplinarity

* Field visits and workshops are recommended to support the diverse practical exercises

INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

NAME OF DEPARTMENT/CENTRE: Department of Design

1. **Subject Code:** IDN-536 **Course Title**: Service Design
2. **Contact Hours:** **L:** 2 **T:** 1 **P:** 0
3. **Examination Duration (Hrs.):** **Theory:** 2 **Practical:** 0
4. **Relative Weightage:** **CWS:** 20-35 **PRS:** 0 **MTE:** 20-30 **ETE:** 40-50 **PRE:** 0
5. **Credits:** 3 **6. Semester:** Spring **7. Subject Area:** PEC
8. **Pre-requisite:** Nil
9. **Objective:** To impart knowledge on basic concepts and methods of service design.
10. **Details of the Course**

S.No.	Contents	Contact hours
1.	Service Design and implementation of design thinking for enhanced service experience	5
2.	Design research to analyse services	5
3.	Creation and ideation of service design concepts: Creation of new consumer services, with a focus on identifying human needs, transformational services; Development of public amenities and services; Envisioning radically new future services and user experiences driven by technological advancements, environmental and social challenges.	12
4.	Prototyping and testing service design	6
Total		**28**

11. **Suggested Books:**

S.No.	Name of Authors/Book/Publisher	Year of Publication / Reprint
1.	Norman, D. Design of Everyday Things, Basic Books; 2nd edition	2013
2.	Tim Brown, Change by Design, Harper Business.	2012
3.	Schneider, J. and Stickdorn, M. This is Service Design Thinking: basics- tools- cases, Wiley; 1st edition	2012

INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

NAME OF DEPARTMENT/CENTRE: Department of Design

1. **Subject Code:** IDN-537 **Course Title**: Research into Design
2. **Contact Hours:** **L:** 2 **T:** 1 **P:** 0
3. **Examination Duration (Hrs.):** **Theory:** 2 **Practical:** 0
4. **Relative Weightage:** **CWS:** 20-35 **PRS:** 0 **MTE:** 20-30 **ETE:** 40-50 **PRE:** 0
5. **Credits:** 3 **6. Semester:** Spring **7. Subject Area:** PEC
8. **Pre-requisite:** Nil
9. **Objective:** To impart knowledge about research design, methods and techniques relevant to design.
10. **Details of the Course**

S.No.	Contents	Contact hours
1.	Research in design- its importance and scope, Areas of research and types of research, Research process- identification of problem, formulation of research questions and hypothesis.	4
2.	Need and process of literature review, style of referencing, bibliography, writing literature review.	4
3.	Research Paradigms and Strategies: Various systems of inquiry, Overview of different research strategies.	4
4.	Research methods	4
5.	Experimental and Simulation Research Methods: Their basic assumptions, techniques used and strength and weaknesses. concepts, application of design principles.	4
6.	Tools and Techniques: Used for collecting data (observational studies, surveys, interviews) and analyzing data (quantitative, qualitative, multivariate analysis and software applications) for different research methods.	4
7.	Report writing	4
Total		**28**

11. **Suggested Books:**

S.No.	Name of Authors/Book/Publisher	Year of Publication / Reprint
1.	Hanington, Bruce & Martin, Bella. Universal Methods of Design: 125 Ways to Research Complex Problems, Develop Innovative Ideas, and Design Effective Solutions., Rockport Publishers	2019
2.	Holtzblatt, Karen and Beyer, Hugh. Contextual Design: Design for Life., Morgan Kaufmann; 2nd edition	2016
3.	Koskinen, I., Zimmerman, J. et al. Design Research Through Practice From the Lab, Field, and Showroom., Elsevier	2011
4.	Zeisel, John. Inquiry by Design: Environment / Behavior / Neuroscience in Architecture, Interiors, Landscape, and Planning., W. W. Norton & Company; Revised edition	2006

INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

NAME OF DEPARTMENT/CENTRE: Department of Design

1. **Subject Code:** IDN-549 **Course Title**: Design for Social Inclusion
2. **Contact Hours:** **L:** 2 **T:** 0 **P:** 2/2
3. **Examination Duration (Hrs.):** **Theory:** 2 **Practical:** 0
4. **Relative Weightage:** **CWS:** 15-30 **PRS:** 20 **MTE:** 15-25 **ETE:** 30-40 **PRE:** 0
5. **Credits:** 3 **6. Semester:** Spring **7. Subject Area:** PEC
8. **Pre-requisite:** Nil
9. **Objective:** To sensitise and inspire design for social inclusion with a human centric approach.
10. **Details of the Course**

S.No.	Contents	Contact hours
1.	Understanding Social inclusion, Concepts of Sustainable Design, Social Sustainability	3
2.	Demographic perspectives of Ageing, Gender, Disabilities in Global South and Global North	3
3.	Understanding Universal Design and Concepts of Inclusion, Universal Design Principles and Case Studies	4
4.	Inclusive Design for Children, Women and Diversity	4
5.	Design for Ageing, Products and Systems for Elderly well-being, Assistive Designs, Lifespan design	3
6.	Design for Disability, Assistive Technologies, Inclusive Products and Systems	4
7.	Inclusive Design for Low Resource context, Design and Social Transformations, Design Futures	4
8.	National and International Policies and Paradigms of Inclusion	3
Total		**28**

11. **Suggested Books:**

S.No.	Name of Authors/Book/Publisher	Year of Publication / Reprint
1.	Ezio Manzini, Design when everybody designs: An Introduction to Design for Social Innovation, The MIT Press	2015
2.	Regine M. Gilbert, Inclusive Design for a Digital World; Design with Accessibility in Mind, Apress	2019
3.	Jonathan Hassell, Inclusive Design for Products, Rethink Press	2019
4.	Elaine Ostroff, Universal Design Handbook, Second Edition, McGraw-Hill Education	2011
5.	Patrick Langdon, Jonathan Lazar, Ann Heyleighen, Hua Dong (Eds.), Designing for Inclusion: Looking towards the future, Springer	2020

12. Suggested Exercise:

- Studies on Products and Systems for Design Inclusion
- Mobility Design and Inclusion for Elderly, Disabled, Women, Children, etc.
- Interface Design for Diverse Population Groups
- Assistive Technology for Low Resource Contexts

Field visits to conduct ethnographic and design studies with live human subjects in diverse contexts.

INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

NAME OF DEPARTMENT/CENTRE: Department of Design

1. **Subject Code:** IDN-541 **Course Title**: Graphic Design
2. **Contact Hours:** **L:** 2 **T:** 0 **P:** 2
3. **Examination Duration (Hrs.):** **Theory:** 2 **Practical:** 0
4. **Relative Weightage:** **CWS:** 10-25 **PRS:** 25 **MTE:** 15-25 **ETE:** 30-40 **PRE:** 0
5. **Credits:** 3 **6. Semester:** Autumn **7. Subject Area:** PEC
8. **Pre-requisite:** Nil
9. **Objective:** To explore visual representation through a range of image-making techniques and to apply the principles of composition to communicate with the help of graphical representation.

10. Details of the Course

S.No.	Contents	Contact hours
1.	Definition and fundamentals of image making, techniques, denotative and connotative meaning	4
2.	Typography, typeface	4
3.	Usage of shape and colour.	4
4.	Icons and symbols	4
5.	Working with colour, colour theories, colour wheel, meaning of colour	4
6.	Visual contrast and balance	4
7.	Composition, image and text	4
Total		**28**

11. Suggested Books:

S.No.	Name of Authors/Book/Publisher	Year of Publication / Reprint
1.	Robert Bringhurst 'The Elements of Typographic Style', Hartley & Marks Inc., U.S.; 2nd edition	2013
2.	Ellen Lupton, Thinking with type: A Critical Guide for Designers, Writers, Editors, & Students second edition, Princeton Architectural Press; 2nd edition	2010
3.	Paul Rand, Paul Rand: A Designer`s Art, Princeton Architectural Press; 1st edition	2016

12. List of Practicals:

S.No.	Practical	Hours
1.	Exploring symmetry, asymmetry, scale, motion and layout	4
2.	Exercises in letterform abstraction, hierarchy of elements	4
3.	Case studies and inferences	4
4.	Group Project	12

INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

NAME OF DEPARTMENT/CENTRE: Department of Design

1. **Subject Code:** IDN-542 **Course Title**: Product Detailing
2. **Contact Hours:** **L:** 3 **T:** 0 **P:** 0
3. **Examination Duration (Hrs.):** **Theory:** 3 **Practical:** 0
4. **Relative Weightage:** **CWS:** 20-35 **PRS:** 0 **MTE:** 20-30 **ETE:** 40-50 **PRE:** 0
5. **Credits:** 3 **6. Semester:** Autumn **7. Subject Area:** PEC
8. **Pre-requisite:** Nil
9. **Objective:** To get exposure about basic modelling of curves, surface, solid, scanning, rendering, animation etc.
10. **Details of the Course**

S.No.	Contents	Contact hours
1.	Detailing in plastic products while using processes like injection molding, vacuum molding, compression molding, F. R. P. molding.	10
2.	Design detailing for fabricated products in sheet metal, steel tubes and angles, aluminum sheets and extruded sections.	9
3.	Detailing while using fabric materials, foam and other cushions, leather and cloth in combination with materials like wood and metal.	9
Total		**28**

11. **Suggested Books:**

S.No.	Name of Authors/Book/Publisher	Year of Publication / Reprint
1.	Ashby M., Johnson K., 'Materials and Design: The Art and science of Material selection in Product Design', Butterworth-Heinemann	2002
2.	Feirer, J. L., 'Cabinet making and mill work', Bennet, Perria	1977
3.	Beadle, J. D., 'Plastic forming, production engineering series', Macmillan, London	1971
4.	Degarmo E P et al., Materials and processes in Manufacturing 9th ed., John Wiley & sons	2002

INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

NAME OF DEPARTMENT/CENTRE: Department of Design

1. **Subject Code:** IDN-543 **Course Title**: Contemporary Visual Design
2. **Contact Hours:** **L:** 3 **T:** 0 **P:** 0
3. **Examination Duration (Hrs.):** **Theory:** 3 **Practical:** 0
4. **Relative Weightage:** **CWS:** 20-35 **PRS:** 0 **MTE:** 20-30 **ETE:** 40-50 **PRE:** 0
5. **Credits:** 3 **6. Semester:** Autumn **7. Subject Area:** PEC
8. **Pre-requisite:** Nil
9. **Objective:** To impart knowledge on the historical backdrop and trends of contemporary design languages. To enable the students, interpret various design styles and apply them into design.

10. Details of the Course

S.No.	Contents	Contact hours
1.	Preamble of Contemporary Design during Post Industrial Revolution Characteristics of Modern and Post-modern Visual Design Languages	3
2.	Phases of Modernism in Art and Design: De Stijl, Bauhaus, Art Deco, Avant-garde, etc. Correlations of modern design and art movements.	15
3.	Phases of Post-modernism in Art and Design: Pop movement, Deconstructivism, Historicism, etc. Correlations of post-modern design and art movements.	10
4.	Works of Contemporary Artists, Designers and Architects	7
5.	Case studies: Contemporary Design languages in the paradigm of Digital media, Typography, Furniture Design, Product Design, Architecture and Fine Arts	7
Total		**42**

11. Suggested Books:

S.No.	Name of Authors/Book/Publisher	Year of Publication / Reprint
1.	Fletcher, B. History of Architecture, CBS publisher	2019
2.	Berger, J. Ways of Seeing, Penguin books	2008
3.	Vidiella, A.S. The sourcebook of Contemporary Architecture, Harper Collins	2008
4.	Gombrich, E.H. The Story of Art, Phaidon Press	2006
5.	Gossel, P. Architecture in the 20th century, Vol- 1 & Vol 2, Taschen	2005

INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

NAME OF DEPARTMENT/CENTRE: Department of Design

1. **Subject Code:** IMN-502 **Course Title**: Technology Management
2. **Contact Hours:** **L:** 2 **T:** 0 **P:** 0
3. **Examination Duration (Hrs.):** **Theory:** 2 **Practical:** 0
4. **Relative Weightage:** **CWS:** 20-35 **PRS:** 0 **MTE:** 20-30 **ETE:** 40-50 **PRE:** 0
5. **Credits:** 2 **6. Semester:** Spring **7. Subject Area:** PCC
8. **Pre-requisite:** Nil
9. **Objective:** To develop an integrative approach to technology management through the entire life cycle.
10. **Details of the Course**

S.No.	Contents	Contact hours
1.	Process and Perspectives of Technology Management, Technology Management Process	3
2.	Scanning, Acquisition, Assimilation, Absorption, Business Strategy and Technology Strategy. Adaptation, Critical Factors in Managing Technology and Improvement and Planning	5
3.	Technology Life Cycle and Forecasting, Technology Transfer, Technology Development: Management of R&D; Product Design and Development; Commercialisation of R&D; R&D-Manufacturing-Marketing Interface; R&D Project Management	5
4.	Technology Development and Competitiveness, Technology and Business Strategy	3
5.	Technology Innovation and Creative Transformation in the Knowledge Age: Critical Trajectories	3
6.	Technology Entrepreneurship	4
7.	IPR, Patenting, Technology Role of Government; International Protocols; Treaties; Standards; International Comparisons of Technology Management	5
Total		**28**

11. **Suggested Books:**

S.No.	Name of Authors/Book/Publisher	Year of Publication / Reprint
1.	Tarek Khalil, Management of Technology: The Key to Competitiveness and wealth Creation, Tata McGraw- Hill: New Delhi.	2009
2.	Stephan Leman Janglois, Techno crime: Technology, Crime and Social Control, Willan Publishing 1st edition	2008
3.	Hashem Sherif & Tarek Khalil, New Direction in Technology Management, Elsevier Publisher, 1st edition	2007
4.	Hans J. Thamhain, Management of Technology: Managing Effectively in Technology Intensive Organisations, John Wiley & Sons., 2nd Edition	2005
5.	Robert C. Megantz, Technology Management: Developing and Implementing Effective Licensing Programs, John Wiley & Sons 1st Edition.	2002

INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

NAME OF DEPARTMENT/CENTRE: Department of Design

1. **Subject Code:** IMN-504 **Course Title**: Contemporary Strategic Management
2. **Contact Hours:** **L:** 3 **T:** 0 **P:** 0
3. **Examination Duration (Hrs.):** **Theory:** 3 **Practical:** 0
4. **Relative Weightage:** **CWS:** 20-35 **PRS:** 0 **MTE:** 20-30 **ETE:** 40-50 **PRE:** 0
5. **Credits:** 3 **6. Semester:** Spring **7. Subject Area:** PCC
8. **Pre-requisite:** Nil
9. **Objective:** To impart knowledge for developing long range strategic plans for any organization.
10. **Details of the Course**

S.No.	Contents	Contact hours
1.	Conceptual foundation of strategy and evolution of strategic management, Vision and mission analysis, goals, values performance, objectives, policies and business model	4
2.	Industry Analysis, Environmental scanning, Internal firm environment (RO Model and Industry Model), and External environment, analyzing, Resources and Capabilities	4
3.	Internal and External perspective of Value Chains with reference to Industry Analysis Strategy and Value Creation in Traditional Industries Objective	4
4.	Strategic actions and Strategy Formulation, Process in Strategy Formulation Business Level strategy, Types of strategies	6
5.	Corporate level strategy, diversification, levels of diversification, International Strategy, Cooperative strategies, collusion, strategic alliances, joint ventures, mergers and acquisitions and the process of due diligence, corporate strategy, growth strategies, stability strategies downsizing strategies	6
6.	Blue Ocean Strategy, Value Innovation, and comparison to “red ocean” strategies; 3 tiers of non-customers, Strategy Canvas; Fortune at the bottom of pyramid capability approach.	4
7.	Sustainability, sustainable business practices, Corporate social responsibility, Ethics, values and business, ethics as a strategy. Designing and Creating Black Swans-Future and the Strategic Leadership, corporate governance.	6
8.	Organizational Structure and Controls, Strategy Implementation and its Stages, Reasons for Strategy Failure and Methods to Overcome, Strategic monitoring evaluation process, criteria and methods, strategic control process, types	8
Total		**42**

11. Suggested Books:

S.No.	Name of Authors/Book/Publisher	Year of Publication / Reprint
1.	Grant, Robert M., "Contemporary Strategy Analysis: Concepts, Techniques, Applications", 7th Edition. John Wiley & Sons	2010
2.	Hitt, Ireland & Hoskisson, "Strategic Management", Cengage Learning	2016
3.	Thompson, A.J., Peteraf, M., Gamble, J. and Strickland, A., "Crafting & Executing Strategy: The Quest for Competitive Advantage: Concepts and Cases", 21st Ed., McGraw-Hill Higher Education	2017
4.	Kim, W.C. and Mauborgne, R.A., "The Blue Ocean Strategy: How to Create Uncontested Market Space and Make the Competition Irrelevant", Harvard Business Press	2015
5.	Thomson & Strickland "Crafting and Executing Strategy: The quest for Competitive Advantage", Tata McGraw – Hill	2017

INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

NAME OF DEPARTMENT/CENTRE: Department of Design

1. **Subject Code:** IMN-506 **Course Title**: Intellectual Property Management
2. **Contact Hours:** **L:** 2 **T:** 1 **P:** 0
3. **Examination Duration (Hrs.):** **Theory:** 2 **Practical:** 0
4. **Relative Weightage:** **CWS:** 20-35 **PRS:** 0 **MTE:** 20-30 **ETE:** 40-50 **PRE:** 0
5. **Credits:** 3 **6. Semester:** Spring **7. Subject Area:** PCC
8. **Pre-requisite:** Nil
9. **Objective:** To impart knowledge about managing various IPs such as patents, copyrights and designs etc.

10. **Details of the Course**

S.No.	Contents	Contact hours
1.	Intellectual Property Management. Market Capitalization, Intellectual Capital (IC), Components of Intellectual Capital, Tangible and Intangible Assets of Firms	4
2.	Corporate Strategy, and Profits, Relationship between Intellectual Capital and Intellectual Property, Knowledge Economy and the need for Intellectual Property Management	6
3.	Various Types of Intellectual Property trademarks, Copyrights, Patents, Trade Secrets, and Industrial Design	6
4.	International IP Treaties/Agreements on IP Rights, Types of Patents, Patenting Advantage, Offensive and Defensive IP Strategies, Global Innovation Index's and IP Management.	6
5.	The Dynamics of Value Creation and Value Capture, Patent Mapping and relevant case studies	6
Total		**28**

11. **Suggested Books:**

S.No.	Name of Authors/Book/Publisher	Year of Publication / Reprint
1.	Marchant GE. Genomics, Ethics, and Intellectual Property. In Intellectual Property Management in Health and Agricultural Innovation: A Handbook of Best Practices (eds. A Krattiger, RT Mahoney, L Nelsen, et al.). MIHR: Oxford, U.K., and PIPRA: Davis, U.S.A.	2007
2.	Phillips, PWB. Governing Transformative Technological Innovation: Who's in Charge? Edward Elgar: Oxford	2007
3.	Spielman DJ., Systems of Innovation: Models, Methods and Future Directions. Innovation Strategy Today 2(1):55-66	2006
4.	WIPO, The Economics of Intellectual Property	2009
5.	OECD, Creating Value from Intellectual Assets, Policy Report	2007

INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

NAME OF DEPARTMENT/CENTRE: Department of Design

1. **Subject Code:** IMN-508 **Course Title**: Process Innovation Management
2. **Contact Hours:** **L:** 2 **T:** 0 **P:** 0
3. **Examination Duration (Hrs.):** **Theory:** 2 **Practical:** 0
4. **Relative Weightage:** **CWS:** 20-35 **PRS:** 0 **MTE:** 20-30 **ETE:** 40-50 **PRE:** 0
5. **Credits:** 2 **6. Semester:** Spring **7. Subject Area:** PCC
8. **Pre-requisite:** Nil
9. **Objective:** The objective of this course is to build foundation on Process Innovation Management.
10. **Details of the Course**

S.No.	Contents	Contact hours
1.	Innovation in process industries, Strategic process innovation, Multiple progression quality function deployment	7
2.	Lean process management, total quality management, EFQM excellence model.	7
3.	Business process re-engineering, the process hierarchy, common stages in BPR process	7
4.	Research models and definition, Incremental and radical innovation, Exploitation and exploration, Contrasting characteristics of TQM and BPR	7
Total		**28**

11. **Suggested Books:**

S.No.	Name of Authors/Book/Publisher	Year of Publication / Reprint
1.	Thomas Lager, Managing process innovations: from idea generation to implementations, Imperial college press	2019
2.	Tor Tonnessen, Managing Process Innovation through Exploitation and Exploration, Springer	2013
3.	Daniel R. A. Schallmo, Leo Brecht, Bujar Ramosaj, Process Innovation: Enabling Change by Technology, Springer	2018

INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

NAME OF DEPARTMENT/CENTRE: Department of Design

1. **Subject Code:** IMN-510 **Course Title**: Product Innovation Management
2. **Contact Hours:** **L:** 2 **T:** 0 **P:** 0
3. **Examination Duration (Hrs.):** **Theory:** 2 **Practical:** 0
4. **Relative Weightage:** **CWS:** 20-35 **PRS:** 0 **MTE:** 20-30 **ETE:** 40-50 **PRE:** 0
5. **Credits:** 2 **6. Semester:** Spring **7. Subject Area:** PCC
8. **Pre-requisite:** Nil
9. **Objective:** To impart knowledge in innovation, strategy, design, and the management of new products.
10. **Details of the Course**

S.No.	Contents	Contact hours
1.	Overview of Product, Strategic Elements of Product Development, The Product Innovation Charter (PIC), New Product Portfolio, The New Products Process and its Phases, product development cycle.	3
2.	Opportunity Identification and Selection, Strategic Planning for New Products, Product Platform Planning, Concept Generation, Creativity and the Product Concept.	2
3.	Analytical Attribute Approaches, Perceptual Mapping, Analysing Product Attributes for Concept Generation and Evaluation, Gap Analysis, Trade-Off Analysis and Qualitative Techniques	4
4.	Concept/Project Evaluation, Product Line Considerations in Concept Evaluation, Planning the Evaluation System, The A-T-A-R Model, Product Innovation Charter, Concept Testing and Development	4
5.	Design, The Role of Design in the New Products Process, Product Architecture Prototype, The valley of Death	4
6.	Development, Development Team Management, Structuring the Team, building a Team, Managing the Team, Virtual Teams, Managing Globally Dispersed Teams, Product Use Testing, Pre-Use Sense Reactions, Early Use Experiences	4
7.	Strategic Launch Planning, Strategic Platform Decisions, Type of Demand Sought, Product Positioning Branding and Brand Management, packaging, Implementation of the Strategic Plan	3
8.	Launch management system, steps, knowledge creation, product failure, failure management, product issues, Business Attitudes toward Product Issues, product liability, planning for product recall	4
Total		**28**

11. Suggested Books:

S.No.	Name of Authors/Book/Publisher	Year of Publication / Reprint
1.	Crawford, M. and Di Benedetto, A.," New products management", McGraw Hill International	2014
2.	Trott, Paul. "Innovation Management & New Product Development", Prentice Hall, Pearson	2011
3.	John Bessant, Joe Tidd, Keith Pavitt "Managing Innovation: Integrating Technological, Market, and Organizational Change", John Willey and Sons Ltd	2013
4.	Verganti, R, Design driven innovation: Changing the rule of competition by radically innovating what things mean, Harvard Business Press, Boston	2009
5.	Clayton M. Christensen "The Innovator's Dilemma When New Technologies Cause Great Firms to Fail", Harvard Business Review Press	2015

INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

NAME OF DEPARTMENT/CENTRE: Department of Design

1. **Subject Code:** IMN-512 **Course Title**: Innovative Services and Business Models
2. **Contact Hours:** **L:** 3 **T:** 0 **P:** 0
3. **Examination Duration (Hrs.):** **Theory:** 3 **Practical:** 0
4. **Relative Weightage:** **CWS:** 20-35 **PRS:** 0 **MTE:** 20-30 **ETE:** 40-50 **PRE:** 0
5. **Credits:** 3 **6. Semester:** Spring **7. Subject Area:** PCC
8. **Pre-requisite:** Nil
9. **Objective:** To enable students to identify, implement and evaluate innovative service offerings and business models.
10. **Details of the Course**

S.No.	Contents	Contact hours
1.	Service Economy and Service Organizations, Role of services in manufacturing firms, recent trends in manufacturing	4
2.	Developing a service strategy, service positioning and implications for service delivery design, degree of customer contact, divergence, customization; Service blue printing	3
3.	Product, Technology, Process and People-centric Services, Technical View of Services: Techniques for Service Analysis, Work System Method, Service Value Networks	5
4.	Business Models, Components of the business model, Business Model Canvas, Various types of Business Models, Generating New Business Model Ideas, Ideation Process, Visual Thinking, Different Types of Visualization.	8
5.	The value proposition, Elements of intangibles, Value creation through intellectual resources	8
6.	Business Model Design Process Design Attitude five phases (Mobilize, Understand, Design, Implement, and Manage) Prototyping, Prototypes at Different Scales	8
7.	Storytelling, Developing the Story, Making Business Models Tangible, Scenario-Guided Business Model Design	2
8.	Evaluating business models, business model perspective on blue ocean strategy, blending the blue ocean strategy framework with the business model canvas Managing multiple business models, Implementing Business Models in Organizations, Aligning IT with Business	4
Total		**42**

11. Suggested Books:

S.No.	Name of Authors/Book/Publisher	Year of Publication / Reprint
1.	Schultz, M and Doerr, J., "Professional services Marketing", Wiley	2009
2.	Lovelock, C., and Wirtz, J, "Essentials of Services Marketing", Pearson Education	2008
3.	Alexander Osterwalder and Yves Pigneur, "Business Model Generation: A Handbook for Visionaries, Game Changers, and Challengers", Wiley	2010
4.	Adam J. Bock and Gerard George "The Business Model Book: Design, Build and Adapt Business Ideas that Drive Business Growth", Pearson Education Limited	2017
5.	Raphael Amit and Christoph Zott, Business Model Innovation Strategy: Transformational Concepts and Tools for Entrepreneurial Leaders", Wiley	2020

INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

NAME OF DEPARTMENT/CENTRE: Department of Design

1. **Subject Code:** IMN-514 **Course Title**: Financing and Marketing of Innovation
2. **Contact Hours:** **L:** 3 **T:** 0 **P:** 0
3. **Examination Duration (Hrs.):** **Theory:** 3 **Practical:** 0
4. **Relative Weightage:** **CWS:** 20-35 **PRS:** 0 **MTE:** 20-30 **ETE:** 40-50 **PRE:** 0
5. **Credits:** 3 **6. Semester:** Spring **7. Subject Area:** PCC
8. **Pre-requisite:** Nil
9. **Objective:** To impart knowledge on financing and marketing innovation effectively.
10. **Details of the Course**

S.No.	Contents	Contact hours
1.	Sources of finance for financing innovation: Venture capital, Angel investors, Private equity and crowd funding etc.	8
2.	Framework of financing innovation, Financing innovation at different stages, Financing Innovation in Emerging Markets	8
3.	Marketing of Innovation, Types of Innovations from Marketing Science Perspective and common characteristics of High-Technology Environment, Value creation communication and delivery of Innovative Solutions.	8
4.	Value Capture with Innovative Solutions, Partnerships and Strategic Alliances in New Product Development	6
5.	Marketing Research and Innovations, Marketing mix for innovations	6
6.	Consumer Behaviour, Segmentation and Adoption Process, Strategic Market Planning in Innovative Firms	6
Total		**42**

11. **Suggested Books:**

S.No.	Name of Authors/Book/Publisher	Year of Publication / Reprint
1.	Lourdes Casanova, Peter Klaus Cornelius and Soumitra Dutta, 'Financing Entrepreneurship and Innovation in Emerging Markets' Academic Press.	2018
2.	Michael Kahn, Luiz Martins Melo, Marcelo G. P Matos 'Financing Innovation-BRICS National Systems of Innovation', Routledge India.	2017
3.	Cooper, R. G. 'Winning at New Products: Creating Value Through Innovation' New York: Basic Books, Fifth edition	2017
4.	Eleonora Pantano, Clara Bassano, Constantinos-Vasilios Priporas, Technology, and Innovation for Marketing, Routledge	2019
5.	Peter Doyle, Susan Bridgewater, Innovation in Marketing, Routledge	1999

INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

NAME OF DEPARTMENT/CENTRE: Department of Design

1. **Subject Code:** IMN-521 **Course Title**: IP Portfolio Management
2. **Contact Hours:** **L:** 2 **T:** 1 **P:** 0
3. **Examination Duration (Hrs.):** **Theory:** 2 **Practical:** 0
4. **Relative Weightage:** **CWS:** 20-35 **PRS:** 0 **MTE:** 20-30 **ETE:** 40-50 **PRE:** 0
5. **Credits:** 3 **6. Semester:** Autumn **7. Subject Area:** PEC
8. **Pre-requisite:** Nil
9. **Objective:** To impart knowledge how to manage portfolio of IP in an organization.
10. **Details of the Course**

S.No.	Contents	Contact hours
1.	Strategizing patent portfolio management: - Aligning IP strategy with R&D and business strategies, IP SWOT (strengths, weaknesses, opportunities and threats) analysis	4
2.	Budgeting and organizing patent portfolio management: - General cost-saving measures; centralization of patent renewals and translations; monitoring-based countermeasures, Generation of inventions; invention portal; invention disclosure form; submission of inventions, Screening; novelty search; review processes, Invention assessment.	6
3.	Patent filing strategies: - Priority filings: strategies, Further filings and country selection for patent granting strategies, ranking-based tiers strategies	6
4.	Ensuring quality and extracting value from the patent portfolio: - Criteria for a valuable patent portfolio, identifying valuable patents: strategies for patent portfolio review; inventor review questionnaires, third party product searches, Patent intelligence tools i.e. Derwent Innovation Software, Analyzing and confirming value of identified patents: ranking systems; claim charting, dynamically adapting prosecution to value: ranking and target-based prosecution.	6
5.	Pruning the patent portfolio: - Monthly/yearly pruning, Pruning Recommendation Tool: criteria, scores, recommendations, Understanding the logic of strategy maps and balanced scorecards for IP management	6
Total		**28**

11. **Suggested Books:**

S.No.	Name of Authors/Book/Publisher	Year of Publication / Reprint
1.	Brant Jennifer and Lohse Sebastian, Enhancing Intellectual Property Management and Appropriation by innovative SMEs, International Chamber of Commerce	2013
2.	WIPO, Conceptual Study on Innovation, Intellectual Property and Informal Economy	2013
3.	Ian Ellis and Kenan Patrick Jarboe, Intangible assets in capital markets, Intellectual Asset Management	2010

INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

NAME OF DEPARTMENT/CENTRE: Department of Design

1. **Subject Code:** IMN-522 **Course Title**: Intellectual Value and Corporate Value Creation
2. **Contact Hours:** **L:** 2 **T:** 1 **P:** 0
3. **Examination Duration (Hrs.):** **Theory:** 2 **Practical:** 0
4. **Relative Weightage:** **CWS:** 20-35 **PRS:** 0 **MTE:** 20-30 **ETE:** 40-50 **PRE:** 0
5. **Credits:** 3 **6. Semester:** Autumn **7. Subject Area:** PEC
8. **Pre-requisite:** Nil
9. **Objective:** To understand meaning of IP value, and how IP can contribute in corporate value creation.
10. **Details of the Course**

S.No.	Contents	Contact hours
1.	Importance of IP for SMEs, Trademarks and Industrial Designs, Invention and Patent, Legal aspects of innovation & IP, Case study	4
2.	Trade Secrets, Copyright, Trademark, and other forms of IP; their importance and relevance	6
3.	Technology Licensing in a Strategic Partnership, IP Licensing, Technology transfer agreement	6
4.	Role of IP in digital economy, IP for identifying the business components, How IP recognizes the business opponent's	6
5.	IP: National & International Trade, Valuation of IP Assets, IP Issues in Franchising.	6
Total		**28**

11. **Suggested Books:**

S.No.	Name of Authors/Book/Publisher	Year of Publication / Reprint
1.	OECD "Creating Value from Intellectual Assets", Policy Report,, http://www.oecd.org/science/inno/36701575.pdf	2007
2.	Zorina Kahn, IP Rights and Economic Development: A Historical Perspective", WIPO Magazine	2007
3.	John Henshall (Deloitte & Touché LLP, London), Supply chain restructuring: IP transfer pricing and taxation (four pages): BNA International	2008
4.	Joshua S. Gans "The Value of IP Protection in Markets for Ideas" Australian Intellectual Property Law Bulletin, Vol.16, No.6,	2003
5.	WIPO, Valuation of Intellectual Property: What How and Why	2003

INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

NAME OF DEPARTMENT/CENTRE: Department of Design

1. **Subject Code:** IMN-523 **Course Title**: Licensing and Commercialization of IP
2. **Contact Hours:** **L:** 2 **T:** 1 **P:** 0
3. **Examination Duration (Hrs.):** **Theory:** 2 **Practical:** 0
4. **Relative Weightage:** **CWS:** 20-35 **PRS:** 0 **MTE:** 20-30 **ETE:** 40-50 **PRE:** 0
5. **Credits:** 3 **6. Semester:** Autumn **7. Subject Area:** PEC
8. **Pre-requisite:** Nil
9. **Objective:** To impart knowledge about Licensing, Commercialization and Management of various Intellectual Properties such as patents, copyrights, trademarks, industrial designs geographical designs etc.

10. **Details of the Course**

S.No.	Contents	Contact hours
1.	Intellectual Property (IP): Discoveries, Innovations and Inventions; Invention *v/s* Innovation; Types of IP Rights; Single and Multiple IPR for a Product.	2
2.	Patent IPs: Patentee, Inventor and Assignee; The Indian Patent Act (1970) as Amended in 2005; Patentable Work and Not Patentable Work; Categories of Inventions Not Patentable in India; Patenting in India, Patenting Outside India.	3
3.	SEP: IPR and Standards and their Compliance, Standard Development Organizations (SDOs) and their Role during and after Standardization; Standard and Essential Patents (SEP), their interface, particularly with engineering and technology; their preparation; the rights of owners and users of SEP	4
4.	IP Law and Competition Law and its importance for information and communication technology (ICT); Cases of anti-competitive behaviour by SEP holder; FRAND its concept, significance and importance; FRAND licencing and its applications with examples for Internet of Things (IoT), 5G and other technology	4
5.	Agreements for IPs: Types of Agreements; Licensing Agreements; Non-Discloser Agreements; Technology-Transfer Agreements; Joint Venture Agreements; Franchising Agreements	4
6.	Licenses for Various IPs: License and Compulsory License, Patent Licenses, Know-How and Trade Secret Licenses, Trademark Licenses, Copyright Licenses; Time duration to initiate licencing and strategies	4
7.	Analysis for Commercialization of IP: Use or Lose IP!; Time duration to initiate commercialization and strategies; Market Analysis, IP Audit, IP Valuation	4
8.	Commercialization and Royalty on IP: Financing and Capital through IPR, Branding, Advertising and Marketing; Commercializing IP; Royalty on IP.	3
Total		**28**

11. Suggested Books:

S.No.	Name of Authors/Book/Publisher	Year of Publication / Reprint
1.	Stoianoff NP, Chilton F, Monotti AL, Giles K (Lawyer), Harris JR; Commercialisation of Intellectual Property, Lexis Nexis Butterworths.	2019
2.	McManus, JP; Intellectual Property: From Creation to Commercialisation; Oak Tree Press	2012
3.	Richard Raysman R, Pisacreta EA, Adler KA, Ostrow SH; Intellectual Property Licensing: Forms and Analysis; Law Journal Press	2021
4.	Nikolic, Igor Licensing Standard Essential Patents, FRAND and the Internet of Things; Zed Books	2021
5.	Petrovic, Urska Competition Law and Standard Essential Patents; Kluwer Law International	2014