

3.0 PROGRAM CONTENT

FIRST YEAR / SEMESTER ONE

DESIGN COMPUTATION STUDIO - I (INTRODUCTION TO PARAMETRIC DESIGN)

COURSE CODE: DC 6501

COURSE CREDITS: 07

COURSE INTENT

This course aims to promote awareness and understanding of the fundamentals of computational design exploring form development through parametric methodology and converting it into scaled models through additive fabrication methods.

Students are expected to choose projects based on their domain expertise and interests.

COURSE CONTENT

The course covers the introduction to form development with focus on principles and elements of parametric design using visual programming tools. Identifying and interpretation of the input data streams and converting it into parametric variables, exploring combinations that will facilitate multiple iterations for design morphologies, critically analyze the output for user centered impactful solutions and fabricate to test the performative capabilities of the generated form.

COURSE OUTCOMES

After completion of this course the student will be able to:

CO1: Understand the principles of parametric design and computational design processes.

CO2: Apply the proficiency gained in computational tools to design and develop basic parametric models

CO3: Analyze complex parametric models to understand their underlying rules and logic.

CO4: Evaluate different parametric strategies based on criteria such as material efficiency, aesthetics, and performance.

CO5: Propose design solutions that respond to real-world constraints using parametric tools.

PARAMETRIC MODELING

COURSE CODE: DC 6503

COURSE CREDITS: 05

COURSE INTENT

The focus will be on learning the fundamentals of parametric design and how to use software tools to create and manipulate parametric models.

COURSE CONTENT

Overview of parametric design concepts, setting up a workspace and interface basics, exploring hierarchical relationships and dependencies, editing parameters to control design outcomes, applying geometric constraints: parallelism, perpendicularity, tangency, etc., using formulas and equations to drive design, understanding parametric curves and surfaces, data structures, exploring algorithmic thinking in design and optimization.

COURSE OUTCOMES

After completion of this course the student will be able to:

CO1: Outline the basics of parametric way of designing.

CO2: Apply proficiency in parametric design software tools (e.g., Rhino, Grasshopper, Fusion 360, etc.).

CO3: Construct a model with data structures, input/output data flow using visual programming.

CO4: Evaluate parametric software for complex use cases.

CO5: Examine parametric design solutions in engineering and architectural problems.

DIGITAL DESIGN PROCESS AND HISTORY

COURSE CODE: DC 6505

COURSE CREDITS: 03

COURSE INTENT

This course explores the historical development of computational design, its theoretical underpinnings, and its impact on creative disciplines like architecture, industrial design, graphic design, and digital media.

COURSE CONTENT

Students will examine how computational thinking, algorithmic design ideas and fabrication tools have shaped design practices over time, culminating in contemporary applications such as generative design, parametric modeling, and artificial intelligence in design

COURSE OUTCOMES

After completion of this course the student will be able to:

CO1: Explain the historical evolution of computational design

CO2: Understand key theoretical and philosophical concepts underlying computational approaches in design.

CO3: Analyze the impact of computational tools and methodologies on design practices.

CO4: Evaluate computational techniques in creating design artifacts.

CO5: Critically reflect on ethical, cultural, and societal implications of computational design.

RESEARCH METHODOLOGY

COURSE CODE: DC 6507

COURSE CREDITS: 04

COURSE INTENT

To equip students with research methods, tools and techniques to undertake research in Computational Design.

COURSE CONTENT

Basic Concepts and Research Process: Domain of research; Understanding the nature of research in Built Environment- Need & significance; Objectives; Characteristics; Ethics – Responsible conduct of research; Concepts of theory, data and reference management tools. Research methods in Built Environment – Types of Research; Research methods & Research methodology; Review of literature; research gap. Research design – Need for research, develop the research question, hypothesis, research methodology, scope and limitations. Data collection and analysis – Primary and secondary data collection, survey, observation, case study, post-occupancy evaluation, behavioural mapping, tracking, documentation and interpretation, selection of respondents and sampling procedures, techniques of analysis. Use of software in analysis, presentation and interpretation methods and techniques. Technical writing: Technical writing of research reports, publications, and proposals.

COURSE OUTCOMES

After completion of this course the student will be able to:

CO1: Explain the basic concepts and understand the characteristics of research.

CO2: Identify the research methods in built environment.

CO3: Evaluate the procedure for hypothesis

CO4: Analyze the data collection and sampling methods and illustrate the method of data collection.

CO5: Propose and communicate a feasible research report.

INTRODUCTION TO CODING FOR DESIGNERS

COURSE CODE: DC 6509

COURSE CREDITS: 03

COURSE INTENT

The focus will be on learning the basics of Python programming language and how to use it for real world solutions.

COURSE CONTENT

Overview of Python and its applications, setting up the environment, Variables, data types, and type conversions, looping structures, Function arguments and return values, Lists, tuples, sets, and dictionaries, Classes and objects, file input-outputs, error handling and working with external libraries.

COURSE OUTCOMES

After completion of this course the student will be able to:

CO1: Understand core programming concepts, including OOP and data structures.

CO2: Apply proficiency through writing simple python programs

CO3: Analyze real-world applications using Python.

CO4 Evaluate external libraries for data science, visualization, and web scraping.

CO5: Create mini-projects and a final capstone project demonstrating their skills.

FIRST YEAR / SEMESTER TWO

DESIGN COMPUTATION STUDIO-II (INNOVATION BY COMPUTATION)

COURSE CODE: DC 6502

COURSE CREDITS: 07

COURSE INTENT

This course explores algorithmic techniques and data-driven approaches to create adaptive, generative design solutions across various domains such as architecture, urban planning, and product design.

COURSE CONTENT

The course emphasizes creativity, technical proficiency, and integration of algorithms into diverse design workflows: Understanding & integrating data in design with sources of data (environmental, user generated and from sensors). Algorithmic thinking in design using recursion, fractals, cellular automata, rule-based vs stochastic design methods. Performance-driven design in energy, structural, and environmental simulations and Integration with external analysis tools (Ladybug, Karamba, CFD)

COURSE OUTCOMES

After completion of this course the student will be able to:

CO1: Understand fundamental principles of generative and parametric design.

CO2: Apply computational tools to create data-driven design solutions

CO3: Analyze algorithms for parametric and generative modeling

CO4: Evaluate data analytics in design decision-making

CO5: Propose performance-driven design strategies in energy, structural, or environmental simulations

DIGITAL TOOLS FOR ANALYSIS AND OPTIMIZATION

COURSE CODE: DC 6504

COURSE CREDITS: 05

COURSE INTENT:

The focus will be on learning the parametric software tools for analysis and optimization techniques.

COURSE CONTENT:

This course introduces parametric tools and methodologies for design, analysis, and optimization across various domains. Participants will learn to create and manipulate parametric models, perform simulations, and apply optimization techniques to achieve efficient and innovative solutions

COURSE OUTCOMES

After completion of this course the student will be able to:

CO1: Understand and use various digital tools for data collection and analysis.

CO2: Apply proficiency in using software tools for parametric analysis and optimization.

CO3: Analyze simulation models to predict environmental impacts.

CO4: Evaluate strategies for multi-objective optimization and decision-making.

CO5: Propose simulated solutions to real-world design and engineering problems.

MATERIAL SYSTEMS AND FABRICATION PROCESSES

COURSE CODE: DC 6506

COURSE CREDITS: 03

COURSE INTENT:

This course explores the relationship between materials, fabrication methods, and design innovation. It provides a hands-on and theoretical understanding of material properties, performance, and processing techniques. The course integrates computational design tools, digital fabrication technologies, and traditional manufacturing methods to enable students to develop innovative, efficient, and sustainable material systems.

COURSE CONTENT:

Introduction to Material Systems: Understanding material properties (mechanical, thermal, optical, electrical), Classification of materials (metals, polymers, ceramics, composites, biomaterials), Topology optimization and bio-inspired design

Fabrication Processes and Techniques : Traditional manufacturing (casting, machining, forming, joining), Digital fabrication (CNC milling, laser cutting, 3D printing), Advanced manufacturing (robotic fabrication, 4D printing, bio fabrication)

Smart and Responsive Materials : Programmable materials (shape-memory alloys, self-healing polymers), Embedded sensors and actuation

Sustainability and Circular Economy in Fabrication : Sustainable material sourcing and recycling, Waste reduction strategies in fabrication, Life-cycle analysis and impact assessment

COURSE OUTCOMES

After completion of this course the student will be able to:

CO1: Understand materials based on performance, sustainability, and fabrication constraints.

CO2: Apply proficiency in materials selection and techniques for different fabrication requirements.

CO3: Analyze the role of automation, CNC, and Industry 4.0 in modern fabrication

CO4: Evaluate cutting, forming, and welding processes safely and effectively.

CO5: Create innovative material systems through research and prototyping.

ETHICS IN TECHNOLOGY

COURSE CODE: DC 6508

COURSE CREDITS: 03

COURSE INTENT

The Ethics in Technology course explores the ethical challenges and responsibilities associated with technological advancements in areas such as artificial intelligence, cybersecurity, privacy, automation, and intellectual property.

Students will learn how ethical theories apply to real-world technology scenarios and analyze case studies of ethical controversies in the technology industry.

COURSE CONTENT

Foundations of Ethics in Technology, Professional & Corporate Tech Ethics, Privacy, Data Ethics, and Surveillance, Artificial Intelligence & Algorithmic Bias, Cybersecurity & Ethical Hacking, Intellectual Property & Digital Rights, Regulation, Compliance, and Governance in Tech Ethics, Case Studies on Ethical Issues in Technology

COURSE OUTCOMES

After completion of this course the student will be able to:

CO1: Understand ethical principles and frameworks in the context of technology.

CO2: Apply social, legal, and moral implications of emerging technologies.

CO3: Analyze ethical dilemmas in fields like AI, cybersecurity, digital privacy, and automation.

CO4: Evaluate professional codes of ethics from organizations like IEEE, ACM, and ASME.

CO5: Assess real-world case studies to identify ethical challenges and propose solutions.

SECOND YEAR / SEMESTER THREE

DIGITAL DESIGN STUDIO – III (GENERATIVE DESIGN TECHNIQUES)

COURSE CODE: DC 7001

COURSE CREDITS: 07

COURSE INTENT

This course introduces evolutionary computation and genetic design algorithms as powerful methods for solving optimization, search, and design problems. Students will learn the theoretical foundations and practical applications of genetic algorithms (GA), genetic programming (GP), and other bio-inspired computing techniques.

Students are expected to choose projects based on their domain expertise and to undertake a focused study based upon a research question.

COURSE CONTENT

The emphasis of this course is on understanding the principles of evolutionary computation and how it applies to design. Topics include computational methods in analysis, optimization, performance evaluation, parametric modeling, and simulation for informed design decision-making.

COURSE OUTCOMES

After completion of this course the student will be able to:

CO1: Understand the principles of evolutionary computation.

CO2: Apply genetic algorithms for optimization and search problems.

CO3: Analyze key concepts in computational design, optimization, and generative processes.

CO4 Evaluate optimization genetic algorithms like particle swarm optimization (PSO) , ant colony optimization (ACO) algorithms or similar.

CO5: Create evolutionary algorithms to real-world design problems in engineering, AI, and robotics.

EMERGING TECHNOLOGIES IN COMPUTATIONAL DESIGN

COURSE CODE: DC 7003

COURSE CREDITS: 05

COURSE INTENT

Emerging technologies in computational design are reshaping how we conceptualize, simulate, and create built environments, products, and systems.

Students will gain hands-on experience and understand the impact of these technologies across industries to create and evaluate applications in gaming, healthcare, education, and other fields.

COURSE CONTENT

1. Use of AI models to generate 2D/3D design alternatives based on user-defined goals and constraints including texture generation.
2. AR/VR for Design Visualization: Immersive design reviews, virtual walkthroughs, and spatial planning using tools like Unity, Unreal Engine
3. 3D concrete printing techniques and processes.

COURSE OUTCOMES

After completion of this course the student will be able to:

CO1: Understand the technical components of AI diffusion models, VR/AR, including hardware, software, and interaction models.

CO2: Apply recent advancements in 3D printing technologies

CO3: Analyze basic VR/AR applications using tools like Unity, Unreal Engine, and AR SDKs.

CO4: Evaluate the outcomes of AI diffusion models, VR applications and 3D concrete printed buildings.

CO5: Assess the impact of these emerging technologies on industries such as gaming, healthcare, education, and business.

THESIS SEMINAR

COURSE CODE: DC 7005

COURSE CREDITS: 04

COURSE INTENT

The primary intent of this course is to equip students with the methodological skills and knowledge necessary to conduct a comprehensive literature review, fostering a deeper understanding of their chosen research topic.

COURSE CONTENT

The primary objective is to utilize the techniques and approaches learned in the course to conduct comprehensive research within the sphere of Computational Design. This implies employing the acquired knowledge and tools to delve into specific areas of the domain that are of interest or that require further exploration. This course equips students with the critical skills to conduct thorough and methodical investigations into existing literature within the realm of sustainable design. It provides a solid understanding of the systematic review process, including defining research questions, identifying relevant databases, executing a comprehensive search strategy, and critically appraising the selected studies. The course emphasizes the importance of a well-structured literature review in fostering the development of sustainable design solutions. By synthesizing relevant research, students can identify gaps in the current knowledge base, set the context for their design projects, and build a strong foundation for their Thesis (Research) or Final Project (Design) course.

COURSE OUTCOMES

After completion of this course the student will be able to:

CO1: Understand the Purpose and Process of Literature Reviews.

CO2: Apply Skills in Literature Search and Selection.

CO3: Analyze Data Extraction and Quality Assessment Techniques.

CO4: Evaluate Techniques for Data Synthesis and Interpretation.

CO5: Assess Reporting and Communicating Findings.

PROFESSIONAL TRAINING (SUMMER INTERNSHIP)

COURSE CODE: DC 7007

COURSE CREDITS: 02

COURSE INTENT

To provide opportunities for students to gain practical experience through an internship.

COURSE CONTENT

This is an internship-oriented course. The students are expected to do an internship during the summer vacation as per the training manual provided in an NGO, consulting company, research agency/centers or a government department engaged in computational or similar development. Students are expected to present their findings and observations through an interactive seminar, report after returning to university as it would have an evaluation component.

Students need to choose Industry internship for Final Project (Design) or Research internship for Thesis (Research).

COURSE OUTCOMES

After completion of this course the student will be able to:

CO1: Recall and enhance specific skills related to the computational field.

CO2: Summarize valuable practical experience in a real-world setting to outline its trends, challenges, and opportunities.

CO3: Build a professional network by interacting with professionals in the computational field.

CO4: Examine workplace norms, ethics, etiquette, and professionalism.

CO5: Evaluate skills and capabilities with tangible examples to potential employers.

YEAR TWO / SEMESTER FOUR

THESIS (RESEARCH) OR FINAL PROJECT (DESIGN)

COURSE CODE: DC 7002

COURSE CREDITS: 18

COURSE INTENT

To give an opportunity to the student to explore a project/ Research related to Computational design.

To come up with a design level proposal/ Findings & recommendations for the same.

COURSE CONTENT

Thesis (Research):

For the research thesis, it could include system development and algorithm development tools or framework design. Policy analysis and policy design. Policy implementation model. Trend predictions. Etc. critique of design and trends in the industry, application of various new technologies, evolve best practices or guidelines to achieve the aim of computational development.

The research thesis gives the student an opportunity to apply the discipline and skills of the program to an individually selected research topic, requiring a measure of original development, providing a vehicle for conducting an in-depth investigation, analysis and critical review of relevant material.

The research thesis should reflect all the aspects of Computational Design, and the technical knowledge gained from the entire course which may include the simulations. The Thesis is the culmination of work done on the program and is considered to be of prime importance.

All students are encouraged to produce a publishable paper based on the Thesis material.

At the end of the semester, each student is expected to submit all the original research work as per the department's specifications.

Final Project (Design):

The student must focus on a computational design related form or process in a tangible way that can easily be quantified. Each student is required to select an independent study with reference to a special topic in Computational Design, before the end of the third semester in consultation with the faculty members. Identification of the project with its significance, scope, and limitations. Programming research related to the project and evolving the project briefly. Preparing a project proposal and presenting it in a graphical and textual format.

The Final Project should reflect all the aspects of Computational Design, and the technical knowledge gained from the entire course which may include the simulations. The Final Project is the culmination of work done on the program and is considered to be of prime importance.

The document includes report, computer simulation results and technical drawing if required. The work will be in the form of necessary drawings to explain the project and its details. A comprehensive report of the project and the related study will be submitted which will include the above drawings.

COURSE OUTCOMES

After completion of this course the student will be able to:

CO1: Recall and recognize key concepts, theories, and principles related to computational design.

CO2: Demonstrate ability to critically analyze existing literature, theories, methodologies, or design practices.

CO3: Outline research/design methods, justify choices, and confirm approach towards strong methodological rigor.

CO4: Discuss application of findings, recommendations, or design solutions in real-world contexts to practitioners, policymakers, or other stakeholders.

CO5: Propose potential future research avenues, design iterations, or extensions of your work for further exploration.

PROGRAM ELECTIVES- I

GENERATIVE AI FUNDAMENTALS

COURSE CODE: DC 6510

COURSE CREDITS: 2

COURSE INTENT

This course provides a comprehensive understanding of the fundamental concepts, models, tools, and applications of generative AI.

COURSE CONTENT

Describe the capabilities of generative AI and its use cases in the real world. Identify the applications of generative AI in different sectors and industries. Explore common generative AI models and tools for text, code, image, audio, and video generation. Explain the concept and relevance of prompt engineering in generative AI models. Explore commonly used tools for prompt engineering to aid with prompt engineering. Explain the concept of foundation models in generative AI. Explore the capabilities of pre-trained models for AI-powered applications. Explore the features, capabilities, and applications of different generative AI platforms like open-source Hugging Face. Identify the ethical issues, concerns, and misuses associated with generative AI. Explain the transformative impact of generative AI on the business and industry landscape.

COURSE OUTCOMES

CO1: Understand the fundamental concepts, capabilities, models, tools, applications, and platforms of generative AI foundation models.

CO2: Identify the limitations of generative AI and explain the ethical concerns and considerations for the responsible use of generative AI.

CO3: Analyze the ability of generative AI to implement text generation, image generation and code generation.

CO4: Evaluate powerful prompt engineering techniques to write effective prompts and generate desired outcomes from AI models.

CO5: Create AI use-cases on your domain expertise.

UX DESIGN FUNDAMENTALS

COURSE CODE: DC6512

COURSE CREDITS: 2

COURSE INTENT

The course aims to introduce students to the core principles and methodologies of UX design, emphasizing the role of designers in shaping user experiences. Through a combination of theoretical insights and hands-on practice, students will explore the processes involved in creating engaging, user-centered designs. By following a structured approach to ideation, research, development, and testing, students will gain practical skills to build effective digital prototypes. This course is designed to provide a strong foundation in UX design principles and methodologies, preparing students to implement best practices in various design contexts.

COURSE CONTENT

This course begins with an introduction to UX design concepts, exploring its significance, key principles, and the designer's role in enhancing user experience. The second module dives into creative ideation, articulation, and the development of design ideas, focusing on brainstorming techniques, storytelling, and wireframing strategies. In the third module, students will explore planning techniques, usability testing, research methods, and experience mapping to understand user behavior and improve design decisions. The fourth module emphasizes practical design-building techniques, including wireframing, prototyping, and refining user interfaces to meet user needs effectively. Finally, the fifth module engages students in simulating UX design experiences using digital tools, where they will create functional digital prototypes for a multi-screen application. Throughout the course, students will engage in hands-on projects, translating theoretical knowledge into practical outcomes that align with current UX design trends and standards.

COURSE OUTCOMES

CO1: Understand UX design principles of user-centered design, usability, and interaction design fundamentals.

CO2: Apply design concepts, ideation techniques, wireframing, and storytelling to create effective UX solutions.

CO3: Analyze UX Research methods, usability testing, and experience mapping to enhance design decisions.

CO4: Evaluate interactive prototypes and functional wireframes for digital interfaces.

CO5: Create improved User Experience through refined digital products to align with industry best practices and user needs.

BUILDING INFORMATION MODELLING (BIM) FUNDAMENTALS

COURSE CODE: DC6514

COURSE CREDITS: 2

COURSE INTENT

The Building Information Modelling (BIM) Fundamentals course introduces students to the core principles, concepts, and technical skills required to create and manage BIM models. The course is designed to provide hands-on experience in using BIM tools for modeling, retrieving information, and understanding digital workflows. Students will explore the role of BIM in improving collaboration, efficiency, and decision-making in the architecture, engineering, and construction (AEC) industry. By the end of the course, students will be equipped with the foundational skills needed to work with BIM models, extract relevant data, and contribute effectively to BIM-based projects.

COURSE CONTENT

This course begins with an introduction to BIM and course preparation, where students will understand the fundamentals of digital construction and the importance of BIM in the AEC industry. The second module covers BIM fundamentals, including BIM principles, modeling techniques, and industry standards. Students will learn how to create basic 3D models and navigate BIM software interfaces. The third module focuses on viewing and retrieving information from BIM models, teaching students how to analyze project data, extract quantities, and interpret BIM models for decision-making. The final module involves the development of a BIM model, where students apply their skills to create and modify BIM models using various tools and methodologies. This hands-on approach ensures that students gain practical experience in handling real-world BIM scenarios.

COURSE OUTCOMES

CO1: Understand the Fundamentals of BIM –key concepts, benefits, and applications of BIM in the AEC industry.

CO2: Apply proficiency in using BIM tools to create and modify digital models.

CO3: Analyze BIM Data and interpret project information, including quantities, materials, and spatial relationships.

CO4: Evaluate BIM Models for architectural and construction projects.

CO5: Create BIM Workflows in Real-World Scenarios to improve collaboration, visualization, and efficiency in building projects.

PROGRAM ELECTIVES- II (Skill Based)

FOUNDATIONS OF MACHINE LEARNING (ML)

COURSE CODE: DC7009

COURSE CREDITS: 2

COURSE INTENT

This course provides a comprehensive introduction to fundamental components of artificial intelligence and machine learning (AI & ML) infrastructure. You will explore the critical elements of AI & ML environments, including data pipelines, model development frameworks, and deployment platforms. The course emphasizes the importance of robust and scalable design in AI & ML infrastructure.

COURSE CONTENT

Introduction to AI/ML infrastructure , Data sources and pipelines, frameworks, and platforms
Data acquiring, data cleaning and preprocessing, maintaining efficient data sources for RAG
Introduction to popular ML framework, Implementing a model for business deployment
Tools and frameworks for model deployment,
Real-world case studies of successful AI/ML deployments

COURSE OUTCOMES

By the end of this specialization, students will be able to:

- CO1: Understand the critical components of AI & ML infrastructure and their interrelationships.
- CO2: Identify efficient data pipelines for AI & ML workflows.
- CO3: Analyze and evaluate model development frameworks for various AI & ML applications.
- CO4: Evaluate AI & ML models for deployment in production environments.
- CO5: Create and deploy AI/ML use-cases on your domain expertise.

UI/UX DESIGN SPECIALIZATION

COURSE CODE: DC7011

COURSE CREDITS: 2

COURSE INTENT

The UI/UX Design Specialization aims to equip students with a strong foundation in user interface (UI) and user experience (UX) design through a design-centric approach. This program emphasizes practical, skill-based instruction focused on visual communication rather than marketing or programming. Students will explore the entire UI/UX development process, from user research and defining project strategy to creating wireframes, prototypes, and final digital experiences. By engaging in hands-on learning, students will develop the necessary skills to design intuitive and visually engaging digital interfaces for websites and mobile applications. This specialization is suitable for those interested in UI/UX design, web design, human-computer interaction, or related fields.

COURSE CONTENT

This course begins with an introduction to the visual elements of UI design, covering typography, color theory, iconography, and layout principles to create aesthetically engaging interfaces. The second module delves into UX design fundamentals, focusing on user-centered design, research methodologies, usability principles, and information architecture to enhance user experience. The third module explores web design strategy and information architecture, emphasizing the development of sitemaps, structuring content, and defining a project's strategy and scope. The final module, web design: wireframes to prototypes, involves translating concepts into interactive wireframes, high-fidelity mockups, and functional digital prototypes. Through a series of applied projects, students will gain hands-on experience in structuring screen-based content, refining digital designs, and building user-friendly interfaces aligned with industry's best practices.

COURSE OUTCOMES

By the end of this specialization, students will be able to:

CO1: Understand UI Design Principles through visual design elements such as typography, color, and layout to create aesthetically appealing interfaces.

CO2: Apply UX Design Fundamentals by implementing user-centered design methodologies, usability principles, and information architecture to enhance user experience.

CO3: Analyze Web Design Strategy and Structure by defining a website's strategic goals, create sitemaps, and organize content for optimal navigation and accessibility.

CO4: Evaluate Wireframes and Prototypes with high-fidelity mockups using industry-standard tools.

CO5: Create a Complete UI/UX Design Process and demonstrate all stages of UI/UX design, from user research to final digital product development.

BUILDING INFORMATION MODELING (BIM) APPLICATIONS

COURSE CODE: DC7013

COURSE CREDITS: 2

COURSE INTENT

The Building Information Modelling (BIM) Applications course provides students with an in-depth understanding of BIM workflows and practical applications in real-world construction projects. The course focuses on developing BIM models using Autodesk Revit, integrating multiple disciplines for clash detection, performing quantity takeoff, and executing 4D simulation using Navisworks. Students will gain hands-on experience in managing and analyzing BIM data for effective project planning, coordination, and visualization. By the end of the course, students will be proficient in utilizing BIM tools to optimize construction processes and enhance project efficiency.

COURSE CONTENT

The course begins with an Introduction to BIM Applications and Course Preparation, where students will be familiarized with BIM workflows, software interfaces, and project requirements. The second module focuses on Building a BIM Model, where students will use Autodesk Revit to construct a 6-story BIM model step by step from CAD drawings, developing an understanding of architectural, structural, and MEP elements. The third module covers Model Integration and Clash Detection, introducing students to coordination techniques, interdisciplinary model integration, and clash detection using Navisworks to identify and resolve design conflicts. The fourth module, Quantity Takeoff and Cost Estimation, teaches students how to extract material quantities from BIM models for cost estimation and project budgeting. Finally, the fifth module on 4D Simulation and Construction Scheduling guides students through linking time and construction sequences to their BIM models, simulating real-time project progress using Navisworks for effective construction planning. Through hands-on exercises, students will gain practical experience in applying BIM applications in a professional setting.

COURSE OUTCOMES

By the end of this specialization, students will be able to:

CO1: Understand BIM models using Autodesk Revit, incorporating architectural, structural, and MEP components.

CO2: Apply Model Integration and Clash Detection through multi-discipline models and use Navisworks to identify and resolve design conflicts.

CO3: Analyze Quantity Takeoff and Cost Analysis of material quantities and perform cost estimation using BIM models for project budgeting.

CO4: Evaluate 4D Simulation for Project Planning linking BIM models with scheduling data to simulate construction sequences and optimize project timelines.

CO5: Create BIM Applications in Real-World Scenarios utilizing BIM workflows to enhance coordination, reduce errors, and improve construction efficiency.