MANIPAL SCHOOL
OF ARCHITECTURE AND PLANNING

MANIPAL
(A constituent unit of MAHE, Manipal)

INSPIRED BY LIFE

COURSE OUTCOMES

M. DES. (SUSTAINABLE DESIGN)

SEMESTER I

SD 6501: INTEGRATED SUSTAINABLE PROJECT- I

On successful completion of this course, the student will be able to:

- Identify sustainable and green features for the project.
- Make use of systematic approach for designing the project.
- Analyse the impact of design strategies on energy, water, and material consumption using calculation and simulation.
- Examine the design strategies and their relative cost-benefit implications.
- Recommend design strategies and choices effectively as a business case to the client.

SD 6503: THERMAL PERFORMANCE IN BUILT ENVIRONMENT

On successful completion of this course, the student will be able to:

- Understand the fundamentals of building physics (heat, moisture, and air transfer) and thermal comfort.
- Solve problems related to heat conduction and the built environment.
- Solve problems related to heat convection and the built environment.
- Solve problems related to heat radiation and the built environment.
- Solve problems related to multimodal heat, moisture, and air transfer and the built environment.

SD 6505: SUSTAINABLE LIGHTING & VISUALIZATION (Theory and VR lab)

On successful completion of this course, the student will be able to:

- Understand terms & terminologies related to lighting (Daylighting and Artificial)
- Discuss basic science related to Illumination.
- Identify the needs of daylighting.
- Measure the real time daylight and evaluate the simulation model.
- Design, develop and visualize daylight strategies and lighting schemes by applying fundamentals
  of natural & artificial lighting.

SD 6507: RESEARCH METHODOLOGY

On successful completion of this course, the student will be able to:

- Explain the basic concepts and understand the characteristics of research.
- Identify the research methods in built environment.
- Evaluate the procedure for hypothesis
- Analyse the data collection and sampling methods and illustrate the method of data collection.
- Propose and communicate a feasible research report.

SD 6509: DATA SCIENCE & ANALYTICS

On successful completion of this course, the student will be able to:

- Interpret the relationships considering variables from the field of architecture.
- Understanding of Excel and data analysis.
- Understanding of computer programming and data analysis.
- Model data driven scenarios for decision making and optimization in architectural design process.
- Plan data visualization as reports to generate inferences for decision making.

SEMESTER: II

SD 6502: INTEGRATED SUSTAINABLE PROJECT- II

On successful completion of this course, the student will be able to:

- Understand the context of project
- Identify the need of different passive strategies for demand reduction.
- Analyse the passive strategies to improvise the design.
- Evaluation of passive strategies.
- Propose comprehensive strategies for improved the performance of the project.

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SD 6504: HIGH PERFORMANCE BUILDING SIMULATION (DESIGN LAB)

On successful completion of this course, the student will be able to:

- Understand Energy Simulation process and tools.
- Demonstrate the use of Simulation for whole building energy performance evaluation.
- Analyse the appropriateness of different decision taken in the design process with evidence basis of building energy modelling.
- Evaluate the worthiness of different design decisions.
- Maximize the energy efficiency of the building by enhancing the energy consumption of the building using the different input variables of architectural design.

SD 6506: INTELLIGENT BUILDING SYSTEMS & SERVICES (DESIGN LAB)

On successful completion of this course, the student will be able to:

- Understand basic concepts, requirements and standards related to HVAC.
- Design of energy Efficient HVAC system for a building.
- Understand basic concepts of Building monitoring, control and automation.
- Develop control schemes for Smart Building applications.
- Make use of various data sources for development of control schemes.

SD 6508: ENERGY ECONOMICS AND POLICIES

On successful completion of this course, the student will be able to:

- Understand energy as resource & its demand & supply.
- Identify the environmental impact of energy consumption and production.
- Identify the process of assessing life cycle.
- Examine policy goals, agencies, policy drivers, and their interrelationships.
- Perceive economic decisions related to energy.

SEMESTER: III

SD 7001: INTEGRATED SUSTAINABLE PROJECT- III

On successful completion of this course, the student will be able to:

- Understand the context of project by case study, Climate analysis, Neighbourhood context and Site analysis.
- Identify the need of different active and passive strategies for demand reduction.
- Analyse the active and passive strategies through simulation tool and improvise the design.
- Evaluation effect of site development on active and passive strategies using evidence-based methods and cost benefit analysis.
- Propose adequate active and passive strategies for improved performance.

SD 7003: HIGH PERFORMANCE BUILDING OPTIMIZATION (DESIGN LAB)

On successful completion of this course, the student will be able to:

- Demonstrate awareness of current topics of research in building performance.
- Model simulation-based use cases for sensitivity analysis and optimization.
- Model simulation-based custom logic for dynamic control strategies using external data.
- Model urban building energy scenario.
- Model occupant behavior scenario.

SD 7005: THESIS SEMINAR

On successful completion of this course, the student will be able to:

- Understand the Purpose and Process of Literature Reviews.
- Develop Skills in Literature Search and Selection.
- Learn Data Extraction and Quality Assessment Techniques.
- Master Techniques for Data Synthesis and Interpretation.
- Practice Reporting and Communicating Findings.

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SD 7005: PROFESSIONAL TRAINING (SUMMER INTERNSHIP)

On successful completion of this course, the student will be able to:

- Recall and enhance specific skills related to the sustainability field.
- Summarize valuable practical experience in a real-world setting to outline its trends, challenges, and opportunities.
- Build a professional network by interacting with professionals in sustainability field.
- Examine workplace norms, ethics, etiquette, and professionalism.
  Prove skills and capabilities with tangible examples to potential employers.

SEMESTER: IV

SD 7002: THESIS (RESEARCH) OR FINAL PROJECT (DESIGN)

On successful completion of this course, the student will be able to:

- Recall and recognize key concepts, theories, and principles related to sustainable design.
- Demonstrate ability to critically analyze existing literature, theories, methodologies, or design practices.
- Outline research/design methods, justify choices, and confirm approach towards strong methodological rigor.
- Discuss application of findings, recommendations, or design solutions in real-world contexts to practitioners, policymakers, or other stakeholders.
- Propose potential future research avenues, design iterations, or extensions of your work for further exploration.

PROGRAM ELECTIVES-I (Knowledge Based)

SD 6510: SUSTAINABLE MATERIALS & PRODUCTS

- Understand the environmental issues related to material production and product lifecycle.
- Identify appropriate materials and products for specific applications based on environmental, social, and economic considerations.
- Analyze the environmental and social implications of different material choices and product designs.
- Examine innovative approaches to sustainable design, fostering creativity and critical thinking to develop eco-friendly products.
- Develop a sense of social responsibility and ethical accountability in their design decisions.

SD 6512: SUSTAINABLE ENVIRONMENT AND WASTE MANAGEMENT

- Infer the environmental issues and major challenges.
- Understand the concept of waste management.
- Understand the integrated waste management system.
- Identify recent advanced waste management strategies.
- Inference best practices and emerging technologies in waste management.

SD 6514: BUILDING ACOUSTIC PERFORMANCE

- Demonstrate a thorough understanding of the fundamental principles of sound propagation and room acoustics within built environments.
- Apply acoustic design criteria and select appropriate materials to optimize sound control and enhance acoustic performance in various building types.
- Evaluate and analyze the impact of building materials, room geometry, and HVAC systems on sound transmission and reverberation in indoor spaces.
- Develop and implement effective strategies for noise control, sound insulation, and reverberation management to create acoustically comfortable environments.
- Utilize acoustic measurement techniques, simulation tools, and case studies to assess, propose, and implement sound control measures that promote occupant well-being and functional auditory experiences in architectural design projects.

SD 6516: NET ZERO BUILDING STRATEGIES

- Understand the local climate and select appropriate measures.
- Identify the energy use of a building.
- Develop an integrated net-zero-energy concept for the building.
- Determine a stepped approach to find energy reducing measure.
- Propose an integrated approach for passive and active measures.

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PROGRAM ELECTIVES- II (Skill Based)

SD 7009: PROFESSIONAL COMMUNICATION SKILLS

- Understand the different forms of communication, verbal, non-verbal, and written.
- Apply the language skills (listening, speaking, reading, writing) effectively in diverse contexts.
- Create well-structured written documents with adeptness in written communication skills.
- Construct the principles of business communication to compose professional documents.
- Create engaging presentations using effective verbal and non-verbal communication techniques.

SD 7011: GEOSPATIAL ANALYSIS: GIS AND REMOTE SENSING

- Understand the Concept of space and time; Types of Satellites.
- Understand the Space Agencies in India.
- Explain the Fundamentals of Remote Sensing, Platform and Sensor: Types of Platforms, Types of Sensors, Types of Orbits, and Its applications.
- Analyze the GIS and Remote sensing data using spatial analytical tools. Application of Geospatial Technology in various field.
- Explain the Introduction to GPS, GPS Segments, GPS Satellite constellation, GPS control sites and GPS services and uses.

SD 7013: SUSTAINABLE BUSINESS MANAGEMENT & PRACTICES

- Analyze the concept of sustainability within the context of business management, incorporating environmental, social, and economic dimensions.
- Evaluate the impact of sustainable practices on organizational performance, including financial, social, and environmental aspects.
- Develop sustainable business strategies that address the needs of diverse stakeholders while aligning with organizational objectives.
- Implement sustainable practices across various functional areas of business, such as marketing, operations, and human resources.
- Communicate effectively about sustainable business practices, demonstrating awareness of ethical considerations and transparency in reporting.

SD 7015: DESIGN FOR SUSTAINABILITY

- Knowledge: Students will demonstrate understanding of sustainable design principles and their application in product development.
- Comprehension: Students will interpret the environmental impact of design choices and propose eco-friendly alternatives.
- Application: Students will apply life cycle analysis techniques to assess and improve the sustainability of products.
- Analysis: Students will evaluate the effectiveness of eco-friendly materials in reducing environmental impact within a design context.
- Synthesis: Students will develop innovative solutions that integrate sustainable principles into