



As per the New Revised Syllabus (Rev - 2019 'C' Scheme)
of Mumbai University w.e.f. academic year 2021-2022

Building Services & Repairs

(Code : CEDL05012) (Department Level Optional Course-1)

Semester V - Civil Engineering

Dr. Ajay S. Radke

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Applied Hydraulics	B. L. Singhal, D. Y. Kshirsagar
Geotechnical Engineering-1	Shruti S. Agarwal, Sagar R. Chavhan
Transportation Engineering	Pooja Deepak Pawar
Department Level Optional Course - 1	
Building Services & Repairs	Dr. Ajay S. Radke
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B-20



Detailed Syllabus :

Module	Course Module / Contents	Periods
1	Building services: Mechanical systems	06
	1.1 Lifts/elevators, escalators, conveyors: their components, capacity and principles of working, common problems.(3L).	
	1.2 Motors, Generators, Pumps, HVAC Systems - Heating systems, Cooling Systems, Packaged HVAC, types, capacity, components and their principles of working, common problems.(3L). (Refer Chapter - 1)	
2	Building services: Electrical systems & Illumination in Buildings	07
	2.1 Electrical grids and supply system: Layout of substations Transformers & switch gears, Main & distribution boards, electrical systems in buildings, Single / Three phase supply, ISI specifications, electrical load, electrical layout plan in a building, Types of wires, wiring system & their choice, Solar energy, CCTV, LAN. Protective devices in electrical installation: Earthing for safety, Types of Earthing, fuses, circuit breakers, lightning arrester.(4L)	
	2.2 Principles of Illumination Design: Visual task, Factors affecting visual task, Luminous flux, candela, solid angle illumination, utilization factor. Modern theory of light & color: Synthesis of Light, Additive & Subtractive synthesis of colour, classification of lighting, artificial lights sources, spectral energy distribution, luminous efficiency, color temperature, colour rendering. Level of illumination: Lighting for stores, offices, school, hospitals and house lighting, elementary idea of special features required and minimum level of illumination required in buildings.(3L) (Refer Chapter - 2)	
3	Building services: Plumbing Systems in Building	06
	3.1 Water Distribution system: Material for service pipes, service connection, size of service pipe, Water meter, valves and storage tanks, water requirement for domestic use and firefighting.(2L)	
	3.2 Drainage system: Pipe and traps, system of plumbing, house drainage plans, Chambers- gradient and spacing, manholes, septic tanks and soak pit, Introduction to rain water harvesting system.(2L).	
	3.3 Other plumbing systems: Fire safety, fire-fighting installations, types and purpose, piped gas supply systems, AC ducting.(2L) (Refer Chapter - 3)	

Module	Course Module / Contents		Periods
4	Deterioration of Concrete Structures & Condition assessment		06
	4.1	Durability & Causes of deterioration of concrete structures: effects of climate, moisture, temperature, chemical, wear, erosion & loading on serviceability & durability. Design errors & construction errors, causes of seepage & leakage in concrete structures, formation of cracks including those due to corrosion.(2L)	
	4.2	Condition Survey, Evaluation & Damage Assessment: Structural audit and bye laws. Diagnostic methods & analysis. Destructive, semi-destructive and non-destructive methods: core test, carbonation test, chloride test, petrography, corrosion analysis, cover meter test, rebound hammer test, ultrasonic pulse velocity test, and crack measurement techniques, Concrete endoscopy & thermal imaging, pull- off test & pull-out test.(4L). (Refer Chapter - 4)	
5	Repair Materials & Methodologies For Repairs		08
	5.1	Repair analysis, Repair materials: and their desired properties, Polymer modified mortar/ concrete, micro concrete, bonding chemicals, protective materials and their properties for moisture barrier systems, water-proofing of concrete structures, Systems like integral, crystalline, coatings, membranes, joints sealants, crack repair fillers, corrosion resistant steels, Pre-packed zinc sacrificial anode, Snap-On zinc mesh anode CP system, corrosion inhibitors, rust solvents.(4L).	
	5.2	Repair methodologies: Crack and patch repair, Injection grouting, surface coatings, column jacketing, guniting, shotcrete, Ferroconcrete, FRP, Carbon fiber wrapping, methods of rebar corrosion protection, cathodic protection.(4L) (Refer Chapter - 5)	
6	Repair Process Implementation and Safety During Repairs		06
	6.1	Legal Documentation and Records: Estimates of repair work, procedure and flow chart for repairs, Bill of quantities, Tendering, Work order, Agreement and Contract, Measurement book, bills, security deposits, role of PMC.(3L).	
	6.2	Safety during Repairs: Causes of accidents, safety signs, barricading, insurance, Temporary Support structures such as, formwork, shuttering, centering, staging and scaffolding.(3L). (Refer Chapter - 6)	
Total			39