Dr. YSR Architecture and Fine Arts University

School of Planning and Architecture (**SPA**)

B. Tech in

Building Technology (BT)

R21

Course Structure and Syllabus

DEPARTMENT OF BUILDING TECHNOLOGY

Building Technology and its Services planning is responsible for ensuring the cost-effective, environmentally sound and sustainable design and maintenance of engineering services in buildings. With the current emphasis on sustainability, building services engineers are at the cutting-edge of designing, developing and managing new technologies that integrate into existing systems and services.

Vision

To become a school of excellence that brings out Building services engineers with high technical competencies and promotes high-end research to meet the current and future challenges in Building Technologies and its Services.

Mission

- To offer Under-Graduate program in Building Technology course that add value to student competencies.
- To promote quality education with sound practicality, research and consultancy for various Building Technologies and services and societal needs.
- Emphasizing curriculum serving the building industry with quality services ensuring sustainable, eco-friendly, healthy and quality living space/built environment
- To impart knowledge with emphasis on the development of leadership qualities in students.
- Empowering the students to be self-sustainable and in built potentials to be the future best entrepreneurs.
- To provide state-of-the-art resources that contributes to a congenial learning environment.
- To encourage students to pursue higher education and take competitive exams and various career enhancing courses.
- To establish centers of excellence in emerging areas of research.
- To have regular interaction with industry and offer solutions to their problems.

Program Educational Objectives (PEOs)

PEO 1: Practice engineering in a broad range of building services, societal and real-world applications.

PEO 2: Pursue advanced education, research and development, and other creative and innovative efforts in science, engineering, and technology, as well as other professional careers.

PEO 3: Conduct themselves in a responsible, professional, and ethical manner

PEO 4: Participate as leaders in their fields of expertise and in activities that support service and economic development throughout the world.

Programme Outcomes (POs)

1. Technical and management knowledge: An ability to apply knowledge of science, Engineering, technology and management to the solution of complex problems.

2. Problem analysis: An ability to identify, formulate, review and analyze and solve complex built environment problems

3. Design & development of solutions: An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, and sustainability

4. Analysis, Design and Research: An ability to design and conduct experiments, as well as to analyze and interpret data

5.Modern tool usage: An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice

6. The society and culture: Contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the Built environment sector.

7. Environment and sustainability: The broad education necessary to understand the impact of engineering solutions in global, economic, environmental, and societal context.

8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the professional practice.

9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. Life-long learning: Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Correlation between the POs and the PEOs

PEOs	Programme Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
I		□			□		□			□		
II					□	□	□					
III			□			□		□			□	
IV			□	□	□				□			□

Program Specific Outcomes (PSOs):

PSO1: Acquire Knowledge on construction materials; apply the concepts of analysis and investigation using modern tools to design Engineering structures

PSO2: Ability to understand and apply advanced technologies for real life engineering problems using software tools to analyze, plan, design, and implement solutions

PSO3: Ability to apply project management principles, Legal and contractual aspects to real time projects for efficient execution of construction projects

PSO4: Ability to manage Material, Money and Man power efficiently for execution of construction projects.

COURSE STRUCTURE
SEMESTER I

S.No	Course Code	Course Title	Periods per Week				Credits	Marks			End Exam
			L	S/F	P/T/O	Total		Int	Ext	Total	W/P/J
	Design Studio / Laboratories / Practical										
1	BT21B1S1	Building Services Studio-I	2	6	0	8	8	100	100	200	J
2	BT21B1S2	Graphics & Presentation Techniques	4	0	0	4	4	50	50	100	J
3	BT21B1P1	C-Programming and Data Structures	2	0	2	4	4	50	50	100	P
	General /Basic Science Courses										
4	BT21B1G1	Building Physics	3	0	0	3	3	50	50	100	W
5	BT21B1G2	Environmental Chemistry	3	0	0	3	3	50	50	100	W
6	BT21B1G3	Basics of Surveying	4	0	0	4	4	50	50	100	W
7	BT21B1G4	Engineering Mathematics	4	0	0	4	4	50	50	100	W
	Mandatory Course (AICTE)										
9	MC21B101	UHV-1 Student Induction program(mandatory **(AICTE)**	1	-	-	1	-	-	-	-	-
		Total	**23**	**6**	**2**	**31**	**30**	**400**	**400**	**800**	

Note:

1. W- Written, P- Practical, J-Jury (all Practical and Jury semester end exams for the course will be followed by Viva-Voce)
2. L-Lecturer, S-Studio, P-practical, O-others, F-Fieldwork.

SEMESTER II

S.No	Course Code	Course Title	Periods per Week				Credits	Marks			End Exam
			L	S/F	P/T/O	Total		Int.	Ext.	Total	W/J/P
	Design Studio/Laboratories/Practical										
1	BT21B2S1	Building Services Studio-II	2	6	-	8	8	100	100	200	J
2	BT21B2S2	Construction Materials and Practicalities	-	-	4	4	4	50	50	100	J
3	BT21B2P1	Communication Skills Laboratory	2	-	-	2	2	50	50	100	P
	Professional Core Theory										
4	BT21B2C1	Structural Mechanics	4	-	-	4	4	50	50	100	W
5	BT21B2C2	Fluid Mechanic& Hydraulics	4	-	-	4	4	50	50	100	W
6	BT21B2C3	Building Materials	4	-	-	4	4	50	50	100	W
	General /Basic Science Courses										
7	BT21B2G1	Mathematical Methods	4	-	-	4	4	50	50	100	W
	Mandatory Course										
8	MC21B201	Environmental Science	1	-	-	1	-	-	-	-	-
			21	**6**	**4**	**31**	**30**	**400**	**400**	**800**	

Note:

1. W- Written, P- Practical, J-Jury (all Practical and Jury semester end exams for the course will be followed by Viva-Voce)
2. L-Lecturer, S-Studio, P-practical, O-others, F-Fieldwork.

SEMESTER III

S.No	Course Code	Course Title	Periods per Week				Credits	Marks			End Exam
			L	S/F	P/T/O	Total		Int.	Ext.	Total	W/J/P
	Design Studio/Laboratories/Practical										
1	BT21B3S1	Building Services Studio-II	2	6	-	8	8	100	100	200	J
	Skill Enhancement Course										
2	BT21B3K1	Python Programming	0	2	0	2	2	100	-	100	J
	Professional Core Theory										
3	BT21B3C1	Basics of Electrical Engineering	2	-	2	4	3	50	50	100	W
4	BT21B3C2	Fundamentals of Structural systems	3	-	-	3	3	50	50	100	W
5	BT21B3C3	Thermodynamics	2	-	2	4	3	50	50	100	W
6	BT21B3C4	Water Supply and waste water systems	3	-	-	3	3	50	50	100	W
7	BT21B3C5	Building Technology-I	2	-	2	4	3	50	50	100	W
	Professional Elective -1										
8	BT21B3E1	Renewable Energy sources	3	-	-	3	3	50	50	100	W
	BT21B3E2	Advanced Surveying									
	Open Elective										
9	BT21B3O1	Electrical Estimation and Costing	2	-	-	2	2	100		100	-
	Mandatory Course										
10	MC21B301	Indian Constitution	1	-	-	1	-	-	-	-	
		Total	**20**	**8**	**6**	**34**	**30**	**600**	**400**	**1000**	

Note:

1. W- Written, P- Practical, J-Jury (all Practical and Jury semester end exams for the course will be followed by Viva-Voce)
2. L-Lecturer, S-Studio, P-practical, O-others, F-Fieldwork.

SEMESTER IV

S.No	Course Code	Course Title	Periods per Week				Credits	Marks			End Exam
			L	S/F	P/T/O	Total		Int.	Ext.	Total	W/J/P
	Design Studio/Laboratories/Practical										
1	BT21B4S1	Building Services Studio-IV	2	6	-	8	8	100	100	200	J
2	BT21B4P1	CAD and 3D Modeling	-	-	4	4	4	50	50	100	P
	Skill Enhancement Course										
3	BT21B4K1	Advanced communication skills	0	2	0	2	2	100	-	100	P
	Professional Core Theory										
4	BT21B4C1	Building Technology-II	3	-	-	3	3	50	50	100	W
5	BT21B4C2	Refrigeration Systems	4	-	-	4	4	50	50	100	W
6	BT21B4C3	Electrical Systems	4	-	-	4	4	50	50	100	W
7	BT21B4C4	Climatology and Built Environment	4	-	-	4	3	50	50	100	W
	Mandatory Course										
8	MC21B401	Essence of Indian Traditional Knowledge	1	-	-	1	-	-	-	-	-
	Open Elective										
9	BT21B4O1	Solar Power System	2	-	-	2	2	100	-	100	-
		Total	20	8	4	32	30	550	350	900	

Note:

1. W- Written, P- Practical, J-Jury (all Practical and Jury semester end exams for the course will be followed by Viva-Voce)
2. L-Lecturer, S-Studio, P-practical, O-others, F-Fieldwork.
3. Practical: Where the students does a practical work for a giving problem and is evaluated Studio Jury: Semester work portfolio of the studio is evaluated.
4. *BT21B5IN - Internship/Industrial research will be taken up in the IV sem and the credits are considered in V Sem

SEMESTER V

S.No	Course Code	Course Title	Periods per Week				Credits	Marks			End Exam
			L	S/F	P/T/O	Total		Int.	Ext.	Total	W/J/P
	Design Studio/Laboratories/Practical										
1	BT21B5S1	Building Services Studio-V	2	6	-	8	7	100	100	200	J
2	BT21B5P1	Building Information Modeling	2	-	2	4	3	50	50	100	P
	Skill Enhancement Course										
2	BT21B5K1	Artificial Intelligence & Machine Learning	0	2	0	2	2	100	-	100	J
3	GN21B5CSP	Community Service Project	Vacation (180 hours)				4*	100	-	100	J
	Professional Core Theory										
4	BT21B5C1	HVAC Systems	2	-	2	4	3	50	50	100	W
5	BT21B3C2	Fire Engineering and Science	2	-	2	4	3	50	50	100	W
6	BT21B5C3	Illumination Engineering	2	-	2	4	3	50	50	100	W
7	BT21B5C4	Building Automation and Controls	2	-	2	4	3	50	50	100	W
	Open Elective										
8	BT21B5O1	Fire Protection Equipments and Appliances	2	-	-	2	2	100	-	100	-
			14	**8**	**10**	**32**	**30**	**650**	**350**	**1000**	

Note:

1. W- Written, P- Practical, J-Jury (all Practical and Jury semester end exams for the course will be followed by Viva-Voce)
2. L-Lecturer, S-Studio, P-practical, O-others, F-Fieldwork.
3. *Credits for Mandatory Community Service Project during summer vacation between V semester and VI semester

SEMESTER VI

S.No	Course Code	Course Title	Periods per Week				Credits	Marks			End Exam
			L	S/F	P/T/O	Total		Int.	Ext.	Total	W/J/P
	Design Studio/Laboratories/Practical										
1	BT21B6S1	Building Services Studio-VI	2	6	-	8	8	100	100	200	J
2	BT21B6P1	Computer Applications in MEP	-	-	3	3	3	50	50	100	P
3	BT21B6P2	Energy Simulation and Modeling	-	-	3	3	3	50	50	100	P
	Skill Enhancement Course										
4	BT21B6K1	Fundamentals of IOT	0	2	0	2	2	100	-	100	J
	Professional Core Theory										
5	BT21B6C1	Green Building	3	-	-	3	3	50	50	100	W
6	BT21B6C2	O & M of Building Services	3	-	-	3	3	50	50	100	W
7	BT21B6C3	Estimation, Costing and Specification	2	-	2	4	3	50	50	100	W
	Professional Elective –II										
8	BT21B6E1	Energy Auditing	3	-	-	3	3	50	50	100	W
	BT21B6E2	Safety Health & Environment									
	BT21B6E3	Project Management									
	Open Elective										
9	BT21B6O1	Building Codes (NBC, ECBC, IBC Codes)	2			2	2	100		100	
			15	8	8	31	30	600	400	**1000**	

Note:

1. W- Written, P- Practical, J-Jury (all Practical and Jury semester end exams for the course will be followed by Viva-Voce)
2. L-Lecturer, S-Studio, P-practical, O-others, F-Fieldwork.
3. BT21B7IN - Industrial/ Research Internship mandatory after VI Semester. Evaluation and credit allotment will be given during VII semester

SEMESTER VII

S. No.	Course Code	Course Title	Periods per Week				Credits	Marks			End Exam
			L	S/F	P/T/O	Total		Int.	Ext.	Total	W/J/P
	Design Studio / Laboratories / Practical										
1	BT21B7S1	Building Services Studio-VII	2	6	-	8	8	100	100	200	J
2	BT21B7P1	Pre-Thesis Seminar	3	-	-	3	2	100	-	100	J
3	BT21B7P2	Workshop MEP	-	-	3	3	2	50	50	100	P
4	BT21B7P3	Building Simulations And Modeling	-	-	3	3	3	50	50	100	P
5	BT21B7IN	Industrial/ Research Internship	-	-	-	-	4*	100	-	100	J
	Skill Enhancement Course										
6	BT21B7K1	NPTEL / MOOCS / SWAYAM	0	2	0	2	2	100	-	100	J
	Professional Core Theory										
7	BT21B7C1	Mechanical Circulation Systems	2	-	2	4	3	50	50	100	W
8	BT21B7C2	Contract, Tender and Procurement Management	2	-	2	4	3	50	50	100	W
	Professional Elective -III										
9	BT21B7E1	Project Finance	3	-	-	3	3	50	50	100	W
	BT21B7E2	Human Behavior in Buildings									
	BT21B7E3	Disaster Management in Building services									
			12	**8**	**10**	**30**	**30**	**650**	**350**	**1000**	

Note:

1. Practical: Where the students does a practical work for a giving problem and is evaluated Studio Jury: Semester work portfolio of the studio is evaluated.
2. *Note: W- Written, P- Practical, J-Jury (all Practical and Jury semester end exams for the course will be followed by Viva-Voce)
3. *Credits for Internship done during summer vacation of VI semester
4. Note: L-Lecturer, S-Studio, P-practical, O-others, F-Fieldwork.
5. *Credits for Industrial Internship carried out during summer vacation between VI and VII semesters
6. ***Credits for Industrial Internship carried out during summer vacation between VI and VII semesters.**

SEMESTER VIII

S. No.	Course Code	Course Title	Periods per Week				Credits	Marks			End Exam
			L	S/F	P/T/O	Total		Int.	Ext.	Total	W/J/P
1	BT21B8TH	Thesis	-	-	-	-	18	200	200	400	J
2	BT21B8PT	Internship (Practical Training)	-	-	-	-	12	-	100	100	J
							30	200	300	500	

P- Practical

***Mandatory Internship done during current semester can be extended as major project.**

Note:

- Practical: Where the students does a practical work for a giving problem and is evaluated Studio Jury: Semester work portfolio of the studio is evaluated.
- The evaluation of the Industrial Internship or on the job training will be done as per the guidelines given by APSCHE**.**
- **Open Electives** in **IV, V, VI and VII Semesters** can be selected by the students based on the Subject pool list provided within that semester by academic regulations committee concerned.

SYLLABUS
SEMESTER – I

BT21B1S1 BUILDING SERVICES STUDIO-I

SEMESTER	Course Code	Course Title	L	T	P/S/F	C	Int. Marks	Ext. Marks	Total Marks
I	BT21B1S1	Building Services Studio-I	2	-	6	8	100	100	200

COs	Course Outcomes	POs	BTLs
	The student will be able		
CO1	To impart an understanding of principles of composition, and to appreciate design and design elements. Exercises complement the lectures and ensure that the students learn to develop a series of compositions in two and three dimensions.	1,3,4	1,2,4

MODULE – I

Introduction to Buildings:

Introduction to building typologies- reading building drawings like plans, sections, elevations. Understanding how building works, various components and systems in building-like structural systems, spatial systems, services and networks.

Components in structural systems and how components work together – footings, columns, beams, slabs and their diagrammatic representation in a small building.

Components in spatial systems – various types of spaces designed for different functions; small spaces like toilets, lobbies, corridors etc., Different types of rooms/spaces and their spatial organization. Diagrammatic representation of various spaces; circulation diagrams, connectivity diagrams and the understanding of the functional requirements of the spaces. Introduction to building services as an enhancement of quality of spaces.

Brief introduction to Specific requirements-ventilation, lighting, thermal comfort for different spaces.

Brief introduction to safety requirements- fire safety, security systems etc., for different spaces.

MODULE – II

Plumbing Services and Layout:

Introduction to plumbing services- Water Supply, Waste Water, Storm Water.

Identifying various components and representation of these components by symbols in Water supply, waste water and storm water. Understanding and representing the plumbing services for a building in the form of diagrams.

Case study of residential building; Preparation of plumbing layout for the building; Technical terms and symbols for plumbing installations and accessories for a residence.

MODULE – III

Electrical Services and Layout:

Introduction to electrical services.

Identifying various components and representation of these components by symbols. Understanding and

representing the electrical services for a building in the form of diagrams.
Case study of residential building; Preparation of electrical layout of the building; Technical terms and symbols for electrical installations and accessories of wiring, electrical layout for residence.

MODULE – IV

Mechanical Services and Layout:

Introduction to mechanical services in a building- mechanical circulation systems and HVAC. Mechanical circulation systems like lift, elevators, conveyors and escalators- Various components in each of these systems, diagrammatic representation and location of these systems.

Case study of small commercial complex/ mall. Identification of mechanical circulation systems in relation to the building and its diagrammatic representation.

Brief introduction to concept of HVAC, types of HVAC systems, various components and diagrammatic representation of HVAC systems.

Case study of small commercial complex/ mall. Identification of HVAC systems in relation to the building and its diagrammatic representation.

Expected Output & Assignment:

Suggested outcome in the form of documentation of site visits and case studies, Assignments based on the units topics. Preparing charts displaying various kinds of building services. Preparing schematic diagram for various types of services.

Text Books:

1. Graphic Thinking for Architects and Designers, Third Edition by Paul Laseau: John Wiley & Sons.
2. How buildings work, The Natural Order of Architecture, Third Edition byEdward Allen: Oxford University.

Reference Books:

1. Electrical and Mechanical Services in High Rise Buildings(Design and estimation manual including green buildings) Second Edition, CBS Publishers and Distributors Pvt Ltd., by AK Mittal
2. Refer Building and plumbing codes.

BT21B1S2 GRAPHICS & PRESENTATION TECHNIQUES

SEMESTER	Course Code	Course Title	L	T	P/S/F	C	Int. Marks	Ext. Marks	Total Marks
I	BT21B1S2	Graphics & Presentation Techniques	4	0	0	4	50	50	100

COs	Course Outcomes	POs	BTLs
	The student will be able		
CO1	To understand the fundamentals of drawing and its practice	3,4	2
CO2	To learn the concepts of scales and proportions, its importance and applications	3,4	3
CO3	To learn the Orthographic projections	3,4	3
CO4	To learn the Isometric, Perspective projections	3,4	3
CO5	To learn the Freehand drawing and rendering techniques and also Symbolicrepresentation of building elements	3,4	3
CO6	To draw measured drawing	3,4	3

MODULE – I

Fundamentals of drawing and its practice

Introduction to drawing equipment, familiarization, use and handling simple exercises in drafting,points, types of lines, line thickness and intensities.

MODULE – II

Concepts of scale and proportions

Graphic and numerical scales, dimensioning of lines and planes, enlargement and reduction of drawings, anthropometrics and the scale of man to function, lettering for titles and annotations, freehand lettering, measuring and drawing to scale different objects, rooms etc.

MODULE – III

Orthographic projections

Orthographic projections of points, lines, planes and solids, section of solids.

MODULE – IV

Isometric and Perspective projections

Isometric scale-Isometric views of lines, views of plane figures, simple and compound solids. Study of Parallel and Angular perspective of simple objects.

MODULE – V

Freehand drawing and rendering techniques Graphical representations of trees, hedges, foliage, vehicles, human figures etc in pen and ink, sketching exercises**.** **Symbolic representation of building elements** Representation of building elements, openings, materials, accessories etc., terminology and abbreviations used in architectural presentation.
MODULE – VI
Measured drawings Scales and construction of scales. Measured drawings of simple objects, furniture, rooms, doors and windows, room plans etc., in plan, elevation and section. Enlargement and Reduction.

Text Books:

1. Engineering Drawing by Basant Agarwal and CM Agarwal, Tata McGraw Hill Publications.
2. Geometrical Drawing for Art Students by Thomas, E. French: New York, McGraw Hill
3. Engineering Drawing: Plane and Solid Geometry, 42nd ed. by Bhatt, N.D. and Panchal V.M: Charoter Pub: Anand, 2000
4. T.B. of Geometrical Drawing, 3rd ed, by Gill, P.S: Dewan Suhil Kumar Kataria, Ludhiana,1986

Reference Books:

1. Building Drawing: with an integrated approach to built environment, 7th ed. by Shah, M.G., Kale, C.M. and Patki, S.Y: Tata McGraw Hill Pub., Delhi, 2000
2. Architectural Drafting: Structure and Environment, by Bies, D. John: Bobbs – Merrill Educational Pub., Indianapolis
3. Handbook of Architectural and Civil Drafting, by Nelson, A. John: Van Nostrand Reinhold, New York, 1983.

BT21B1P1 C- PROGRAMMING AND DATA STRUCTURES

SEMESTER	Course Code	Course Title	L	T	P/S /F	C	Int. Marks	Ext. Marks	Total Marks
I	BT21B1P1	C -Programming and Data Structures	2	0	2	4	50	50	100

COs	Course Outcomes	POs	BTLs
	The student will be able		
CO1	To understand the fundamentals of drawing and its practice	3,4	2
CO2	To learn the concepts of scales and proportions, its importance and applications	3,4	3
CO3	To learn the Orthographic projections	3,4	3
CO4	To learn the Isometric, Perspective projections	3,4	3
CO5	To learn the Freehand drawing and rendering techniques and also Symbolic representation of building elements	3,4	3
CO6	To draw measured drawing	3,4	3

MODULE – I

Introduction to Computers – Computer Systems, Computing Environments, Computer Languages, rating and running programs, Software Development Method, Algorithms, Pseudo code, flow charts, applying the software development method.

MODULE – II

Introduction to C Language – Background, Simple C Programme, Identifiers, Basic data types, Variables, Constants, Input / Output, Operators. Expressions, Precedence and associativity, Expression Evaluation, Type conversions, Bit wise operators, Statements, Simple C Programming examples. Selection Statements – if and switch statements, Repetition statements – while, for, do-while statements, Loop examples, other statements related to looping – break, continue, go to, Simple C Programming examples.

MODULE – III

Designing Structured Programs, Functions, basics, user defined functions, inter function communication, Standard functions, Scope, Storage classes-auto, register, static, extern, scope rules, type qualifiers, recursion- recursive functions, Preprocessor commands, example C-programs Arrays – Concepts, using arrays in C, inter function communication, array applications, two – dimensional arrays, multi-dimensional

arrays, C-programme examples.
MODULE – IV
Pointers – Introduction (Basic Concepts), Pointers for inter function communication, pointers to pointers, compatibility, memory allocation functions, array of pointers, programming applications, pointers to void, pointers to functions, command –line arguments. Strings – Concepts, C Strings, String Input / Output functions, arrays of strings, string manipulation functions, string / data conversion, C-programme examples
MODULE – V
Derived types – Structures – Declaration, definition and initialization of structures, accessing structures, nested structures, arrays of structures, structures and functions, pointers to structures, self-referential structures, unions, typeset, bit fields, enumerated types, C programming examples. **Input and Output** – Concept of a file, streams, standard input / output functions, formatted input / output functions, text files and binary files, file input / output operations, file status functions (error handling), C-programme examples.
MODULE – VI
Searching and Sorting – Sorting- selection sort, bubble sort, insertion sort, quick sort, merge sort, Searching-linear and binary search methods. **Data Structures –** Introduction to Data Structures, abstract data types, Linear list – singly linked list implementation, insertion, deletion and searching operations on linear list, Stacks-Operations, array and linked representations of stacks, stack application-infix to postfix conversion, postfix expression evaluation, recursion implementation, Queues-operations, array and linked representations**.**

Text Books:

1. Let us C, 17th Edition, by Yeshavanth Kanethkar
2. Programming in ANSI C, 8th Edition by E.Balaguruswamy.
3. C Programming & Data Structures, Third Edition, by B.A.Forouzan and R.F. Gilberg: Cengage Learning.
4. Problem Solving and Program Design, Fifth Edition, in C,by J.R. Hanly and E. Koffman: Pearson education.
5. C& Data structures – P. Padmanabham, B.S. Publications.

Reference Books:

1. The C Programming Language - B.W. Kernighan, Dennis M. Ritchie, PHI/Pearson Education.
2. C Programming with problem solving - J.A. Jones & K. Harrow, dream tech Press.
3. Programming in C – Stephen G. Kochan, III Edition, Pearson Education.
4. Computer science - A structured programming approach using C, B.A. Forouzan and R.F. Gilberg, Third edition, Thomso
5. Data Structures Using C – A.S .Tanenbaum, Y. Langsam, and M.J. Augenstein, PHI/Pearson education.

BT21B1G1 BUILDING PHYSICS

SEMESTER	Course Code	Course Title	L	T	P/S /F	C	Int. Marks	Ext. Marks	Total Marks
I	BT21B1G1	Building Physics	3	0	0	3	50	50	100

COs	Course Outcomes	POs	BTLs
	The student will be able		
CO1	To understand the geometric relationship between Earth and the sun, helps in orientation design of a building in lowering the heat entry into the	3	2,3
CO2	building based on different locations.	2	2
CO3	Define climate zone, identify and describe several different climate zones	3,4	2,3
CO4	from around the globe	4	2,3
CO5	Understand the importance of climate zoning, understand the concept of thermal comfort and also helps in building design with increasing energy-efficiency.	2	2,3
CO6	Improve the ability to competently and effectively design appropriate building envelopes	3,5	2,3

MODULE – I

Solar Geometry

Earth-Sun relationship: Heliocentric view and loco centric view of Earth, Declination, Altitude, Azimuth and HRA sun path diagrams, solar time and local time, solar radiation. Design Implication in buildings -sol-air temperature only basic concepts.

MODULE - II

Climate Classification

Global Climatic Factors (climate variables) solar radiation, winds, temperature, humidity, precipitation, DBT, WBT, RH. Climate classification- Koppen-Geiger and Atkinson's classification; climate analysis for architectural project (study of design considerations of vernacular buildings basics only)

MODULE – III

Thermal comfort in built environment

Thermal comfort; heat balance equation, thermal equilibrium, Factors influencing thermal comfort: Environmental, Personal, Contributing factors; comfort zone (ASHRAE Standard 55)only basics.

Psychological dimension of thermal comfort; Thermal adaptation and factors influencing it only basics.

MODULE – IV

Building Envelope

About Building envelop; Heat transfer through building envelop (Conduction, Convection, Radiation) Understand how heat, air, moisture, light, and sound affect the envelope of a building, Identify different types of insulation (Resistive, Reflective, capacitive) Energy efficient.

MODULE – V

Acoustics

Introduction, Basic terms related to fundamentals of building acoustics, acoustic materials, Noise control -only basic without design.

MODULE – VI

Glazing and shading systems

Glazing and shading systems in a building basics, Thermal properties of glazing; Shading systems design.

Lighting systems

Basics of lighting system, Indices for measurement of light, Day lighting design, daylight harnessing systems**.**

Text Books:

1. Mumovic D., Santamouris. A Handbook of Sustainable Building Design and Engineering:An Integrated Approach to Energy, Health and Operational Performance.
2. Szokolay S.V. Introduction to Architectural Science: The Basis of Sustainable Design.

Reference Books:

1. Heerwagen D. Passive and active environmental controls.
2. Pinterić M. Building Physics. From physical principles to international standards.

BT21B1G2 ENVIRONMENTAL CHEMISTRY

SEMESTER	Course Code	Course Title	L	T	P/S /F	C	Int. Marks	Ext. Marks	Total Marks
I	BT21B1G2	Environmental Chemistry	3	0	0	3	50	50	100

COs	Course Outcomes	POs	BTLs
	The student will be able		
CO1	To get the basic idea of green chemistry and environment chemistry	1,6	2
CO2	To know about water quality, stabilization and its purification	1	2
CO3	To understand degradation of chemicals	1	2
CO4	To make them efficient in study of indoor air quality	2	2
CO5	To know several concepts of pollution	1	2
CO6	To get briefed about bio-mass and bio-fuels	2	2

MODULE – I

Green Chemistry

Green Chemistry Definition – Goals of Green Chemistry (Basic ideas) – Recycling Definition – Examples – Advantages of Recycling (Basic ideas)

Atmospheric Chemistry

Regions of atmosphere - Chemical and photochemical reactions – photochemical smog, ozone layer depletion – Greenhouse gases and global warming – Acid rain.

MODULE - II

Water quality Physical, chemical and biological parameters of water- Water Quality requirement - Potablewater standards -Wastewater Effluent standards -Water quality indices.

Water stabilization Water softening and water conditioning, chemical precipitation, ion exchange.

Water purification systems in natural systems Physical processes-chemical processes and biological processes - Primary, Secondary and tertiary treatment-Unit operations – unit processes

MODULE – III

Degradation Of Chemicals

Transport and transformation of chemicals – DO, BOD and COD – Photo catalysis - Degradation of foodstuffs, detergents, pesticides and hydrocarbons

MODULE – IV

Indoor Air Quality

Importance of Indoor Air Quality, Pollutants and Sources, Other Factors Affecting Air Quality Effects on Human Health, ROE Indicators

Indoor activities of inhabitants Level of pollutants in indoor and outdoor air- Design and operation of building for improvements of public health – IAQ policy issues- sustainability. Air pollutants in indoor environment- private residences - offices- schools- public building - ventilation

MODULE – V

Indoor Air Quality

Importance of Indoor Air Quality, Pollutants and Sources, Other Factors Affecting Air Quality Effects on Human Health, ROE Indicators

Indoor activities of inhabitants Level of pollutants in indoor and outdoor air- Design and operation of building for improvements of public health – IAQ policy issues- sustainability. Air pollutants in indoor environment- private residences - offices- schools- public building - ventilation

MODULE – VI

Applications

Recycling of waste biomass- Bio fertilizer, Bio pesticides, bioremediation. Biofuels: - Role of microorganism role in algal biofuel, consortia of anaerobic digester Agriculture and Health, Vermi -composting.

Text books:

1. Pelczar, Jr, M.J., E.C.S., Krieg, R.Noel., and Pelczar Merna Foss. "Microbiology 5thedition., Tata McGraw Hill Publishing Company Limited, New Delhi-2001
2. A Text Book of Engineering Chemistry – S.S. Dara – S. Chand Publication.
3. I.S. 10500: 2012, Drinking Water Standards.
4. Indoor Air and Environmental Quality, Godish T., CRC press

Reference Books:

1. Green Chemistry and The Ten Commandments of Sustainability 2nd ed Stanley E.Manahan2006 Chem Char Research, Inc Publishers Columbia, Missouri U.S.A.
2. Colin Baird Environmental Chemistry ‘, Freeman and company, New York, 2011.Manahan,S.E., Environmental Chemistry, Eighth Edition, CRC press, 2009.

BT21B1G3 BASICS OF SURVEYING

SEMESTER	Course Code	Course Title	L	T	P/S /F	C	Int. Marks	Ext. Marks	Total Marks
I	BT21B1G3	Basics of Surveying	4	0	0	4	50	50	100

COs	Course Outcomes	POs	BTLs
	The student will be able		
CO1	To understand the basic principles of surveying, fundamentals & instruments of surveying	1,4,9	1,3
CO2	To learn the standard operations in chain surveying and computation of areas.	1,4,9	1,3
CO3	To learn the principles and procedures of Compass Surveying and compute included angles from given bearings	1,4,9	1,3
CO4	To Plot the closed traverse for the given data and adjust the closing error by using Bowditch rule.	1,4,9	1,3
CO5	To Discuss the basic principles of levelling and Compute the Reduced Levels by different methods.	1,4,9	1,3
CO6	To understand different methods of levelling and contours.	1,4,9	1,3

MODULE – I

Introduction: Definitions – Basic Principles of Surveying; Classification of Survey; Primary Divisions of surveying; Uses of Survey - Scales - Sources of errors in Survey – duties of Surveyor. Difference between plan and a map; Stages of survey operations - Field work, Office work, Care and adjustments of the instruments.

MODULE - II

Chain Surveying – principles of chain surveying, well-conditioned triangle, Types of chains and tapes. Instruments for chaining and taping – conventional Symbols - ranging – obstacles in chain surveying – Errors and mistakes in ordinary chaining Correction due to incorrect length of Chain

Computation of Areas: Trapezoidal rule – Mid ordinate - Average ordinate – Simpson's rule

MODULE – III

Compass Surveying: Introduction –Purpose, principle and uses of compass Survey – Prismatic Compass and Surveyors Compass – Description working and use of Prismatic compass – Operations in using Compass before taking readings (Temporary adjustments of the prismatic compass) – Concept of Meridian-Types of Meridians – Bearing and angle– Types of Bearings – Fore bearing and back bearing – Designationof bearings – local attraction – detection and correction.

MODULE – IV

Compass Traversing and errors: Field work in Compass Survey – field notes-Traverse-Open and Closed Traverse using Prismatic Compass - Determination of included angles from the given bearings and vice versa in compass traverse - Plotting of Compass traverse - closing error and adjustment by Bowditch graphical method – Errors in Compass Surveying.

MODULE – V

Introduction to Levelling and Determination of Reduced level: a). Levelling - Types of levelling - instruments - component parts of a dumpy level and their functions - Definitions of important terms used in Levelling - Temporary adjustments of a dumpy level -Types of Levelling Staves -Bench marks - different types of bench marks -Booking of readings in field book -Determination of Reduced levels by height of instrument and Rise and Fall methods - Comparison of methods - Problems

MODULE – VI

Methods of Levelling and Contouring: Classification of Levelling - Description of profile levelling and Reciprocal levelling - Problems on Reciprocal levelling - Errors in levelling - Personal, natural and instrumental errors – Precautions -Errors due to curvature and refraction and combined correction – problems

Contouring: Introduction to contouring – characteristics and uses - Methods of contouring.

Text books:

1. K.R. Surveying Vol. I, 6th ed. by Arora: Standard Book House, Delhi, 2000

2. Surveying Vol. 1, 13th ed. by Punmia B.C: Laxmi Publications Pvt. Ltd., New Delhi, 1996

Reference Books:

1. Surveying and Levelling, Volume 1, by S. S. Bhavikatti: I. K. International PvtLtd,
2. Surveying Volume 1, by Duggal: Tata McGraw-Hill Education, 2004.

BT121B1G4 ENGINEERING MATHEMATICS

SEMESTER	Course Code	Course Title	L	T	P/S /F	C	Int. Marks	Ext. Marks	Total Marks
I	BT121B1G4	Engineering Mathematics	4	0	0	4	50	50	100

COs	Course Outcomes	POs	BTLs
	The student will be able		
CO1	To get trained thoroughly in Mathematical concepts of ordinary differential equations and their applications.	2,3	2,3
CO2	To prepare students for lifelong learning and successful careers using mathematical concepts of differential and Integral calculus, ordinary differential equations and vector calculus.	2,12	3,4
CO3	To develop the skill pertinent to the practice of the mathematical concepts including the student's abilities to formulate and modelling the problems, to think creatively and to synthesize information.	2,3,4	2,3,4
CO4	To get students learn the concepts of cartesian, polar forms and applications of integration..	2,3	2,3
CO5	To get students learn the concepts of sequences and vector calculus.	2,3	2,3
CO6	To get students learn the concepts of vector integration and vector integration theorems.	2,3	2,3

MODULE – I

Differential equations of first order and first degree, Law of natural growth and decay, orthogonal trajectories.

MODULE - II

Non-homogeneous linear differential equations of second and higher order with constant coefficients with RHS term of the type e^{ax} , Sin ax, cos ax, polynomials in x, e^{ax} V(x), xV(x), method of variation of parameters.

MODULE – III

Rolle's Theorem – Lagrange's Mean Value Theorem – Cauchy's mean value Theorem – Generalized Mean Value theorem (all theorems without proof) Functions of several variables –Functional dependence- Jacobian- Maxima and Minima of functions of two variables with constraints and without constraints.

Rolle's Theorem - Lagrange's Mean Value Theorem - Cauchy's mean value Theorem - (all theorems without proof).

MODULE – IV

Radius, Centre and Circle of Curvature – Evolutes and Envelopes Curve tracing – Cartesian, polar and Parametric curves. Applications of integration to lengths, volumes and surface areas in Cartesian and polar coordinates multiple integrals - double and triple integrals – change of variables – change of order ofintegration.
MODULE – V
Sequences – series – Convergences and divergence – Ratio test – Comparison test – Integral test –Cauchy's root test – Raabe's test – Absolute and conditional convergence. Vector Calculus: Gradient-Divergence- Curl and their related properties of sums- products Laplacian and second order operators.
MODULE – VI
Vector Integration - Line integral – work done – Potential function – area- surface and volume integrals Vector integral theorems: Green's theorem-Stoke's and Gauss's Divergence Theorem (without proof).Verification of Green's - Stoke's and Gauss's Theorems

Text Books:

1. A text Book of Engineering Mathematics, Vol-1 T. K. V. Iyengar, B. Krishna Gandhi and Others, S. Chand & Company.
2. A text Book of Engineering Mathematics, C. Sankaraiah, V. G. S. Book Links.
3. A text Book of Engineering Mathematics, Shahnaz Bathul, Right Publishers.
4. A text Book of Engineering Mathematics, P. Nageshwara Rao, Y. Narasimhulu & Prabhakar Rao, Deepthi Publications

Reference Books:

1. A text Book of Engineering Mathematics, B. V. Raman, Tata Mc Graw Hill.
2. Advanced Engineering Mathematics, Irvin Kreyszig, Wiley India Pvt. Ltd.
3. A text Book of Engineering Mathematics, Thamson Book Collection

MC21B101 UHV-1 STUDENT INDUCTION PROGRAM (MANDATORY AICTE)

SEMESTER	Course Code	Course Title	L	T	P/S /F	C	Int. Marks	Ext. Marks	Total Marks
I	MC21B101	UHV-1 Student Induction Program (mandatory AICTE)	1	-	-	1	-	-	-

COs	Course Outcomes	POs	BTLs
	The Student Induction Program (SIP) The 3-week Student Induction Program (SIP) is to prepare newly admitted undergraduate students for the new stage in their life by facilitating a smooth transition from their home and school environment into the college and university environment through various discussions and activities. The SIP has been formulated with specific goals to help students to:		
CO1	Become familiar with the ethos and culture of the institution (based on Institutional culture and practices)	NA	NA
CO2	Set a healthy daily routine, create bonding in batch as well as between Faculty members and students	NA	NA
CO3	Get an exposure to a holistic vision of life, develop awareness, sensitivity and understanding of the Self---family---Society---Nation---International---Entire Nature	NA	NA
CO4	Facilitate them in creating new bonds with peers and seniors who Accompany them through their college life and beyond	NA	NA
CO5	Overcome weaknesses in some essential professional skills – only for those who need it (e.g. Mathematics, Language proficiency modules)	NA	NA

MODULE – I

The various modules or core areas recommended for the 3-week SIP are:

SIP Module 1: Universal Human Values I (UHV I)

22hours

The purpose is to help develop a holistic perspective about life. A self-reflective methodology of teachingis adopted. It opens the space for the student to explore his/her role (value) in all aspects of living – as an individual, as a member of a family, as a part of the society and as a unit in nature. Through this process of self-exploration, students are able to discover the values intrinsic in them.

The session wise topics are given below:

Session No	Topic Title	Aspirations and Issues	Basic Realities (underlying harmony)
1	Welcome and Introductions	Getting to know each other	Self-exploration
2 and 3	Aspirations and Concerns	Individual academic, career… Expectations of family, peers, society, nation… Fixing one's goals	Basic human aspirations Need for a holistic perspective Role of UHV
4 and 5	Self-Management	Self-confidence, peer pressure, time management, anger, stress… Personality development, self-improvement…	Harmony in the human being
6 and 7	Health	Health issues, healthy diet, healthy lifestyle Hostel life	Harmony of the Self and Body Mental and physical health
8, 9, 10 and 11	Relationships	Home sickness, gratitude towards parents, teachers and others Ragging and interaction Competition and cooperation Peer pressure	Harmony in relationship Feelings of trust, respect… gratitude, glory, love
12	Society	Participation in society	Harmony in the society
13	Natural Environment	Participation in nature	Harmony in nature/existence
14	Sum Up	Review role of education Need for a holistic perspective	Information about UHVII course, mentor and buddy
15	Self-evaluation and Closure	Sharing and feedback	

SIP Module 2: Physical Health and Related Activities

This module is intended to help understand the basic principles to remain healthy and fit and practice them through a healthy routine which includes exercise, games etc.

SIP Module 3: Familiarization of Department/ Branch and Innovation.

This module is for introducing and relating the student to the institution/department/branch; how it plays a role in the development of the society, the state, region, nation and the world at large and how students can participate in it.

SIP Module 4: Visit to a Local Area

To relate to the social environment of the educational institution as well as the area in which it is situated through interaction with the people, place, history, politics…

SIP Module 5: Lectures by Eminent People

Listening to the life and times of eminent people from various fields like academics, industry etc. about careers, art, self-management and so on enriches the student's perspective and provides a holistic learning experience.

SIP Module 6: Proficiency Modules

This module is to help fill the gaps in basic competency required for further inputs to be absorbed. It includes effort to make student proficient in interpersonal communication and expression as well as awareness about linguistic and thereafter NLP.

SIP Module 7: Literature / Literary Activities

Through the exposure of local, national and international literature, this module is aimed at helping the student learn about traditional as well as contemporary values and thought.

SIP Module 8: Creative Practices

This module is to help develop the clarity of humanistic culture and its creative, joyful expression through practice of art forms like dance, drama, music, painting, pottery, sculpture etc.

SIP Module 9: Extra Curricular Activities

This is a category under which things that are not placed in any of the above may be placed. Some clubs and hobby group may be made for each of the above categories, so that students may pursue them even after SIP.

The recommended hours to be allocated are given above. Depending on the available faculty, staff, infrastructure, playgrounds, class timings, hostellers and day scholars etc., the timetable for these activities may be drawn up. Of course, colleges may conduct an inaugural function at the beginning of the SIP; and they may also conduct a celebratory closing ceremony at the end of the SIP. In particular during the lockdown phase, appropriate care may be taken and some or all activities may be planned in distance-learning or on-line mode.

Implementation:

The institution is expected to conduct the 3-week SIP under the guidance of the Director/Principal or Dean Students or a senior faculty member. For this, the institution is expected to make an SIP Cell. The SIP Cell will be responsible for planning, and then implementation of the SIP.

Follow up:

The SIP is only the beginning of the interaction with newly joined students.

An important part of the SIP is to associate one faculty mentor to every small group of about 20 students; and also associate one senior student buddy to an even smaller groups of about 5 students for the guidance required for holistic development of the newly joined student throughout his/her time in the institution/college.

These activities are to be continued in the ongoing academic program along with other cultural activities through the Student Activity Cell (SAC).

SEMESTER-II

BT21B2S1 BUILDING SERVICES STUDIO-II

SEMESTER	Course Code	Course Title	L	T	P/S/F	C	Int. Marks	Ext. Marks	Total Marks
II	BT21B2S1	Building Services Studio-II	2	-	6	8	100	100	200

COs	Course Outcomes	POs	BTLs
	The student will be able		
CO	To impart knowledge related to design process and introduce various problem solving approaches. To develop abilities in design in the context of user requirements of MEP services.	1,2,3,4	1,2,4

MODULE - I
Basic anthropometrics – average measurements of human body in different postures – its proportion and graphic representation, application in the design of simple household furniture. Basic human functions and their implications for spatial planning. Minimum and optimum areas for various functions in a residence.Reference to building norms and standards.
MODULE - II
Introduction to design methodology. Detailed study of functional spaces such as living, dining, bedrooms, kitchen, toilet etc. including the furniture layout, circulation, clearances, lighting and ventilation, etc. Case study of existing house and analysis of the spaces.
MODULE - III
Desktop study and analysis of designed spaces noted for comfort and spatial quality; spatial design and integration of MEP services in the design.
MODULE - IV
Design of a two-bed room house within a given site. Preparation of furniture layouts and MEP service layouts.

Text books:

1. Space planning Basics, by Karlen Mark: Van Nostrand Reinhold, New York,1992
2. Time Saver standards for Interior, by Joseph D Chiara, Julius Panero, &Martin Zelnick:
3. McGraw-Hill Education 2001

Reference Books:

1. Interior Design Illustrated, 2nd edition, by Francis.D. Ching & CorkyBingelli: Wiley publishers,2004.
2. Human Dimension & Interior Space : A source book of Design Reference standards, by JuliusPanero &Martin Zelnick: Watson – Guptill, 1979.
3. Space Planning Basics, by Karlen Mark, Kate Ruggeri & Peter Hahn: Wiley publishers, 2003.

BT21B2S2 CONSTRUCTION MATERIALS AND PRACTICALITIES

SEMESTER	Course Code	Course Title	L	T	P/S/F	C	Int. Marks	Ext. Marks	Total Marks
II	BT21B2S2	Construction Materials and Practicalities	-	-	4	4	50	50	100

COs	Course Outcomes	POs	BTLs
	The student will be able		
CO1	To Acquire knowledge of selection of building materials in construction.	1,3,7	1,5
CO2	To Acquire knowledge of selection on construction elements like floors, doors windows etc.,.	1,3,7	2,5
CO3	To Acquire knowledge on awareness on the materials used in Building services.	1,3	2,4,5
CO4	To acquire the practical knowledge of all materials by field visit.	1,3	2,4,5

MODULE - I

Materials

Bricks- Types of bricks, Sizes of bricks, Market prizes, Applications

Cement- Types of cements, Packing weights, Companies providing different types of cement, Prizes,Applications

Paints- Types of paints, Mixing materials in paints, Companies providing different types of paints, Prices,Different colour available in paints, Applications

Coarse Aggregates (CA) - Sizes of CA, CA extraction, By-product from crushing plants, Applications ofCA & By-product.

Fine Aggregates (FA) - Minerals in FA, Conditions of FA suitable for construction, Applications ofvarious sizes of FA.

Steel- Sizes of steel, Companies, Prices, Density, Applications

MODULE - II

Elements:

Flooring: Types of materials used for flooring, Sizes of materials available, Companies, Prices

Doors: Types of materials used for doors, Sizes, Decorative materials, Companies, Prices

Windows: Types of materials used for windows, Sizes, Decorative materials, Companies, Prices

Ceiling & Walls: Types of decorative materials used, Companies, Prices

MODULE - III

Building Services:

Mechanical: Shapes of ducts and duct materials, lifts and escalators - specifications in regards withcapacities; and company prices.

Electrical: Different electrical elements (wires, colours of wires & uses, switches, types of switches,modals, electrical elements) used, Companies, Prices

Plumbing: Different materials used (sanitary materials, pipes, sizes of pipes), Companies, Prices

MODULE - IV

Field visit report on Step by Step procedure in Construction of Buildings of different typologies.

Text books:

1. Workshop Technology I,II,III, by S K Hajra, Choudhary and A K Chaoudhary: MediaPromoters and Publishers Pvt. Ltd., Bombay
2. Workshop Technology by Manchanda Vol. I,II,III: India Publishing House, Jalandhar
3. Manual on Workshop Practice by K Venkata Reddy, KL Narayana et al: MacMillan India Ltd.New Delhi

Reference Books:

1. Basic Workshop Practice Manual by T Jeyapoovan: Vikas Publishing House (P) Ltd., NewDelhi
2. Workshop Technology by B.S. Raghuwansh: Dhanpat Rai and Co., New Delhi.3.Workshop Technology by HS Bawa:Tata McGraw Hill Publishers, New Delhi.

BT21B2P1 COMMUNICATION SKILLS LABORATORY

SEMESTER	Course Code	Course Title	L	T	P/S /F	C	Int. Marks	Ext. Marks	Total Marks
II	BT21B2P1	Communication Skills Laboratory	2	-	-	2	50	50	100

COs	Course Outcomes	POs	BTLs
	The student will be able		
CO1	To listen, read & speak effectively using vocabulary, write effectively, when necessary, at the workplace for effective Communication, improve employability skills by writing effective resume and can face the interview with confidence, To give effective presentations in various seminars/ workshops/ conferences & can carry out day to day communication at work place by using technology to facilitate efficient interpersonal communication.	10	1,2

Activity List

1. Phonetics
2. Identifying context/ sentences
3. Reading comprehension
4. Describing places/ persons/ picture
5. Introducing/ Ice breaking activity
6. Role play or conversational practice
7. Etiquettes of Telephonic conversation
8. JAM
9. Oral Presentations
10. Group Discussions
11. Letter writing
12. Debates
13. Interview skills- Basic HR questions
14. Resume perpetration.

Software: Orel, Walden Infotech, Young India Films.

Text Books:

1. Muralikrishna C., Sunita Mishra "Communication Skills for Engineers" 2nd edition, Pearson, New Delhi 2010.
2. Krishna Mohan &Meera Banerji: Developing Communication Skills Macmillan India.
3. Raman, M & Sharma, S., Technical Communication: Principles and Practice. Oxford University Press, New Delhi 2014.

Reference Books:

1. Swan, Michael, Practical English Usage, (4e) Oxford University Press, London 2017.

2. Vyas Manish A., Yogesh L. Patel, "Tasks for the English Classroom", MacMillan, New Delhi, 2012.

3. Communication Skills, by Sen, Leena: Prentice Hall of India, New Delhi

4. Communication Skills, by Prasad, P: S.K. Kataria& Sons

5. Course in Listening and Speaking Skills Part I by Geetha Rajivan, Kiranmai: Foundation Books Pvt Ltd.

6. Enrich your Communication in English by Sujatha Mukiri: Lovren Publication Hyd

BT21B2C1 STRUCTURAL MECHANICS

SEMESTER	Course Code	Course Title	L	T	P/S /F	C	Int. Marks	Ext. Marks	Total Marks
II	**BT21B2C1**	**Structural Mechanics**	4	-	-	4	50	50	100

COs	Course Outcomes	POs	BTLs
	The student will be able		
CO1	To provide the basic knowledge of the engineering mechanics by deriving different forces, force systems	**1,2**	**3,4**
CO2	To understand the concept of trusses, calculate and analyse and the force experienced by the members in the truss	**1,4**	**1,2,4**
CO3	To understand the concept of different parameters that are related to stressand strain which helps in progressing the understanding of the subject much better.	**1,2,4**	**2,3,4,5**
CO4	To understand the concept of beam and analyse the simply cum cantilever beam with SFDs and BMDs	**1,2,4**	**2,3,4,5**
CO5	To understand the concept of beam and analyse the simply cum overhanging beam along with relations between SFDs and BMDs	**1,2,4**	**2,3,4,5**
CO6	To understand the concept of centroid and able to calculate for different cross sections	**1**	**1,2**

MODULE – I

Introduction: Forces, system of forces, resultant, equilibrant Parallelogram law, Triangle law, Lamis Theorem, polygon law, resultant of coplanar, concurrent force system, couple, characteristics of couple, moment, Equilibrium.

MODULE - II

Analysis of trusses, types of stresses, Loads on trusses, 2-D truss analysis using method of joint (Cantilever & Simply Supported)

MODULE – III

Stress, Strain, type of stresses, stress-strain curve for ductile Material, Hooke's law, Modulus of Elasticity, Bars of Varying Section, Bars of Composite Section.

Shear stress, types of Strain, Poisson's ratio, Shear modulus Bulk Modulus Relation between the three Elastic Constants members subjected to 3 mutually perpendicular forces).

MODULE – IV

Types of Beams, types of loads, calculation of reactions for simply supported beam (Using Point loads & Udl's) definition shear force & Bending Moment SFD& BMD for Cantilever beams.

MODULE – V

Shear force (SF)& Bending Moment (BM) diagrams for simply supported & over hanging beams for point loads & UDL, point of contra flexure & its location, Relation between loading, SF & BM
MODULE – VI
Definition of centroid, line of symmetry, centroid for some standard shapes, calculation of centroid for shapes like L, T,C,I Sections etc., moment of inertia, Derivation of M.I formula for Rectangle, circle, Triangle, calculation of M .I for L,T,C,I Sections etc.,

Text Books:

1. Engineering Mechanics, by Khurmi. R.S: S. Chand and Co. Ltd., New Delhi, 1999
2. Engineering Mechanics, by S.S. Bhavikatti & K.G. Rajashekarappa, Revised Edition, New Age International (P) Limited, Publishers.

Reference Books:

1. Engineering Mechanics, by Timoshenko. S. and Young, D.H: McGraw-Hill International Editions.
2. Fundamentals of structural mechanics by M.L. Gambhir, PHI Learning Pvt.Ltd

BT21B2C2 FLUID MECHANICS& HYDRAULICS

SEMESTER	Course Code	Course Title	L	T	P/S /F	C	Int. Marks	Ext. Marks	Total Marks
II	BT21B2C2	Fluid Mechanics& Hydraulics	4	-	-	4	50	50	100

COs	Course Outcomes	POs	BTLs
	The student will be able		
CO1	To know about fluid statics and know how to calculate different parameters	2,4	2,5
CO2	To learn about fluid kinematics and dynamics and their applications	2,4	2,5
CO3	To measure closed conduit flow and their losses	2,4	2,5
CO4	To get know the basics of turbo machinery	1	2
CO5	To learn basics on different types of turbines and their purposes	1	2
CO6	To study the functionality of centrifugal pumps	1	2

MODULE – I

Fluid statics:
Dimensions and units: physical properties of fluids- specific gravity, viscosity surface tension- vapor pressure and their influence on fluid motion- atmospheric gauge and vacuum pressure – measurement of pressure- Piezometer, U-tube and differential manometers. Pascal's & hydrostatic laws. Buoyancy and floatation: Meta center, stability of floating body. Submerged bodies. Calculation of metacenter height. Stability analysis and applications.

MODULE - II

Fluid kinematics:
Stream line, path line and streak lines and stream tube, classification of flows-steady & unsteady, uniform, non-uniform, laminar, turbulent, rotational, and irrigational flows-equation of continuity for one dimensional flow.

Fluid Dynamics:
Surface and body forces –Euler's and Bernoulli's equations for flow along a stream line, momentum equation and its application on force on pipe bend.

MODULE – III

Closed conduit flow:
Reynold's experiment- Darcy Weisbach equation- Minor losses in pipes- pipes in series and pipes in parallel- total energy line-hydraulic gradient line.

Measurement of flow:
Pilot tube, venturi meter, and orifice meter, Flow nozzle, Turbine flow meter

MODULE – IV
Basics of turbo machinery: Hydrodynamic force of jets on stationary and moving flat, inclined, and curved vanes, jet striking centrally and at tip, velocity diagrams, work don and efficiency, flow over radial vanes
MODULE – V
Turbines-classification- applications (no problems) and its purposes-only basics, draft tube, cavitation, surge tank, water hammer
MODULE – VI
Centrifugal pumps: Classification, working, work done – manometer head- losses and efficiencies specific speed- pumps in series and parallel-performance characteristic curves, NPSH.

Text Books:

1. Hydraulics, fluid mechanics and Hydraulic machinery, by Dr P.N.Modi and Dr S.M.Seth : RKBansal
2. Fluid Mechanics and Hydraulic Machines, by Rajput :Chand (S.) & Co Ltd ,India,
3. Fluid Mechanics and Fluid Power Engineering, by D.S. Kumar: Kotaria& Sons.
4. Fluid Mechanics and Machinery by D. Rama Durgaiah: New Age International.
5. Hydraulic Machines by Banga & Sharma: Khanna Publishers.

Reference Books:

1. Fluid Mechanics and Machinery, CSP Ojha, Oxford Higher Education
2. Fluid mechanics and machinery by Garde, New Age Pubilishers.
3. Theory and applications of fluid mechanics by K.Subramanyam, TMH Pubilications,New Delhi.
4. Principles of Fluid Mechanics and Fluid Machines by M.Narayana Pillai, Universities Press. 5.
5. Introduction to Fluid Machines by S.K.Som & G.Biswas .Tata Mc.Grawhill publishers PVt.Ltd.
6. Fluid Mechanics by A.K.Mohanty, Prentice Hall of India PVt.Ltd., New Delhi.

BT21B2C3 BUILDING MATERIALS

SEMESTER	Course Code	Course Title	L	T	P/S /F	C	Int. Marks	Ext. Marks	Total Marks
II	BT21B2C3	Building Materials	4	-	-	4	50	50	100

COs	Course Outcomes	POs	BTLs
	The student will be able		
CO1	To understand the properties Stones, Bricks and sand	6,7	1,2
CO2	To understand the properties of Gypsum & Lime. To conduct test on Cement.	6,7	1,2
CO3	To know and understand the different Insulation materials and their properties used in the building construction	6,7	1,2
CO4	Identify the suitability of timber, wood and Glass for building works.	6,7	1,2
CO5	To understand the construction procedure of staircase & Various types ofbuildings	6,7	1,2
CO6	To gain knowledge on various internal and external fittings of a building.	4,7	1,3

MODULE – I

Basic Building materials: Properties and characteristics of Basic building materials – Stone – characteristics of good building stone – types of stone masonry – bricks – characteristics of good quality bricks manufacturing of bricks – types of bonds in brick work – sand – sources of sand – properties of sand.

MODULE - II

Binding Materials: Properties and characteristics of Binding materials – Lime: Classifications of limes, properties of lime – characteristics and usage Cement: Raw materials used, Process of Manufacturing, Chemical composition, Bogue's Compounds - Types of cement, Tests on cement – Uses of cement.

MODULE – III

Insulating Materials: Introduction – Thermal Insulation – Heat Transfer Fundamentals – Thermal Properties of Insulating Materials – Selection of Insulating Materials – Classification of Insulation materials– Commonly Used Building Insulation Materials.

MODULE – IV

Timber: Characteristics of good timber - Seasoning of timber – Importance - Common varieties of timber used for different items of work – Applications – Advantages – Disadvantages.
Glass: Function and utility of glass, types of glasses and their uses.
Plastics: Introduction - Commonly Used Plastics – Applications – Advantages – Disadvantages – Intelligent Use of Plastics in Buildings.

MODULE – V
Basics of Building Components: Components of building, area considerations, Construction Principle and Methods for layout, Damp proofing, anti-termite treatment in buildings, stair cases and their types. Tiles –Types of tiles roofing tiles (Mangalore tiles), floor tiles, Ceramic tiles, Vitrified tiles, Characteristics of good tiles– glazed tiles (uses only)
MODULE – VI
Internal and External Fittings of a Building: Doors and Windows – types of doors and windows and their relative advantages & disadvantages. Types of roof – Types of Lintels and Chajjas, Water Supply and Sanitary fittings (Plumbing), Electric Fittings, Fire Fighting and Fire Protection of Buildings. Plastering and its types, Types and uses of surface protective materials like Paints, Enamels, Varnishes, Distempers, Emulsion.

Text Books:

1. Engineering Materials, by S.C. Rangwala: Ahmedabad Book Depot, 1964
2. Building Material by S K Duggal – New Age International Publishers; Second Edition
3. Building Construction by B.C.Punmia, Ashok Kumar Jain and Arun Kumar Jain Laxmi Publications
   (P) ltd., New Delhi
4. Building Materials by M.L. Gambhir, TMH Pubilishers.
5. A Textbook on Building Construction by S.K. Sharma, S. Chand Pubilishers.
6. Engineering Materials, by G.J. Kulkarni: Ahmedabad Book Depot, 1964.

Reference Books:

1. Building Materials Practice, by Ragsdale & Raynham: London E. Arnold 1972
2. Building Materials, by Deshapande: United Book Corporation, 1962.
3. Francies D.K. Ching – Building Construction illustrated. VNR, 1975

BT21B2G1 MATHEMATICAL METHODS

SEMESTER	Course Code	Course Title	L	T	P/S /F	C	Int. Marks	Ext. Marks	Total Marks
II	BT21B2G1	Mathematical Methods	4	-	-	4	50	50	100

COs	Course Outcomes	POs	BTLs
	The student will be able		
CO1	To instruct the concept of Matrices in solving linear algebraic equations.	2,3	2,4
CO2	To elucidate the different numerical methods to solve nonlinear algebraic equations.	2,3	2,3
CO3	To disseminate the use of different numerical techniques for carrying out numerical integration.	2,3	2,3
CO4	To equip the students with standard concepts and tools at an intermediate to advanced level mathematics to develop the confidence and ability among the students to handle various real world problems and their applications.	2,3,5	3,6
CO5	Students will gain knowledge regarding curve fitting and Numerical solution of Ordinary Differential equations.	2,3	2,4
CO6	Students will gain knowledge regarding Fourier Series and application of Fourier series	2,4	3,6

MODULE – I

Matrices and Linear systems of equations: Elementary row transformations-Rank-Echelon form, Normal form – Solution of Linear Systems – Direct Methods- LU Decomposition- LU Decomposition from Gauss Elimination –Solution of Tridiagonal Systems-Solution of Linear Systems.

MODULE - II

Eigen values, eigen vectors – properties – Cayley-Hamilton Theorem - Inverse and powers of a matrix by Cayley-Hamilton theorem – Diagonolization of matrix. Calculation of powers of matrix – Modal and spectral matrices.

MODULE – III

Real matrices – Symmetric, skew - symmetric, orthogonal, Linear Transformation – Orthogonal Transformation. Complex matrices: Hermitian, Skew-Hermitian and Unitary – Eigen values and eigen vectors of complex matrices and their properties. Quadratic forms- Reduction of quadratic form to canonical form – Rank - Positive, negative definite - semi definite - index - signature - Sylvester law.

Solution of Algebraic and Transcendental Equations: Introduction – The Bisection Method – The Method of False Position – The Iteration Method – Newton-Raphson Method.

MODULE – IV

Interpolation: Introduction- Errors in Polynomial Interpolation – Finite differences- Forward Differences-Backward differences –Central differences – Symbolic relations and separation of symbols-Differences of a polynomial-Newton's formulae for interpolation – Central difference interpolation Formulae – Gauss Central Difference Formulae –Interpolation with unevenly spaced points-Lagrange's Interpolation formula.

MODULE – V

Curve fitting: Fitting a straight line –Second degree curve-exponential curve-power curve by method of least squares. Numerical Differentiation and Integration– Trapezoidal rule – Simpson's 1/3 Rule – Simpson's 3/8 Rule.

Numerical solution of Ordinary Differential equations: Solution by Taylor's series-Picard's Method of successive Approximations-Euler's Method, Runge-Kutta Methods, Predictor-Corrector Methods, Adams-Moulton Method, Milne's Method

MODULE – VI

Fourier Series: Determination of Fourier coefficients – Fourier series – even and odd functions – Fourier series in an arbitrary interval – even and odd periodic continuation – Half-range Fourier sine and cosine expansions. Fourier integral theorem (only statement) – Fourier sine and cosine integrals. Fourier transforms – Fourier sine and cosine transforms – properties – inverse transforms – Finite Fourier transforms.

Text Books:

1. Mathematical Methods,by T. K. V. Iyengar, B. Krishna Gandhi and Others: S. Chand &Company
2. Mathematical Methods,by C. Sankaraiah: V. G. S. Book Links
3. A Text Book of Engineering Mathematics,by B. V. Raman: Tata Mc Graw Hill.

Reference Books:

1. Numerical Methods for Scientific and Engineering Computation, by M. K. Jain, S. R. K.
2. Mathematical methods by Iyengar & R. K. Jain: New Age International Publishers.

MC21B201 ENVIRONMENTAL SCIENCE

SEMESTER	Course Code	Course Title	L	T	P/S /F	C	Int. Marks	Ext. Marks	Total Marks
II	MC21B201	Environmental Science	1	-	-	-	-	-	-

COs	Course Outcomes	POs	BTLs
	The student will be able		
CO1	To understand the importance of environment and natural resources	6, 7	1, 2
CO2	To acquire the knowledge on various principles of eco- systems and their functions.	6, 7	1, 2
CO3	To gain the knowledge on various principles, threats and conservation of bio diversity.	6, 7	1, 2
CO4	To understand the importance of national and international concern for protection of environment from various pollutants	6, 7	1, 2
CO5	To understand various social Issues related to Environment	6, 7	1, 2
CO6	To understand the impact of human population on the environment.	6, 7	1, 2

MODULE – I

Environmental studies–Introduction: - Definition, scope and importance, Measuring and defining environmental development indicators.
Environmental and Natural Resources: Renewable and non-renewable resources - Natural resources and associated problems - Forest resources - Use and over - exploitation, deforestation, case studies - Timber extraction, dams- benefits and problems.

MODULE - II

Basic Principles of Ecosystems Functioning: Concept of an ecosystem. -Structure and function of an ecosystem. - Producers, consumers and decomposers. - Energy flow in the ecosystem Ecological succession. - Food chains, food webs and ecological pyramids. Introduction, types, characteristic features, structure and function of the following ecosystem:

a) Forest Ecosystem
b) Grassland Ecosystem
c) Desert Ecosystem

Aquatic Ecosystem (Ponds, Streams, Lakes, Rivers, Oceans, Estuaries)

MODULE – III

Biodiversity and its conservation: Introduction – Definition- genetic, species and ecosystem diversity. Bio-geographical classification of India
Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts. - Endangered and endemic species of India.
Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity

MODULE – IV

Environmental Pollution: Definition, Cause, effects and control measures of

a) Air pollution
b) Water pollution
c) Soil pollution
d) Marine pollution
e) Noise pollution
f) Thermal pollution
g) Nuclear hazards

MODULE – V

Social Issues and the Environment: From unsustainable to sustainable development -Urban problems related to energy -Water conservation, rain water harvesting, and watershed management - Climate change, global warming, acid rain, ozone layer depletion , nuclear accidents and holocaust. Case Studies. - Waste land reclamation

MODULE – VI

Human Population and the Environment: Population growth, variation among nations. Population explosion Role of information Technology in Environment and human health. - Case Studies.

Field work: Visit to a local area to document environmental assets River /forest grassland/hill/mountain

-Visit to a local polluted site-Urban/Rural/industrial/ Agricultural Study of common plants, insects, birds.

-Study of simple ecosystems- pond, river, hill slopes, etc.

Text Books:

1. Erach Bharucha, A Text Book of Environmental Studies for Under graduate Courses, University Grants Commission.

2. Perspectives in environmental Studies, Anubha Kaushik and C P Kaushik, New Age International Publishers, New Delhi, 2018. 2. A Textbook of Environmental Studies, Shashi Chawla, McGraw Hill Education, New Delhi, 2017.

Reference Books:

1. Environmental Studies by Benny Joseph, McGraw Hill Education, New Delhi, 2017.

2. Fundamentals of environmental studies, Mahua Basu and S Xavier, Cambridge University Press, New Delhi, 2017.

SEMESTER-III

BT21B3S1 BUILDING SERVICES STUDIO-III

SEMESTER	Course Code	Course Title	L	T	P/S /F	C	Int. Marks	Ext. Marks	Total Marks
III	BT21B3S1	Building Services Studio-III	2	0	6	8	100	100	200

COs	Course Outcomes	POs	BTLs
	The student will be able		
CO1	To develop a conceptual understanding of landscape design and siteplanning principles.	1,2,3	2,4,5
CO2	To develop skills in integrating landscape design with built environments.	1,2,3	2,4,5

MODULE – I

General Site Context and Characteristics

- Geographic location, adjacent land use patterns, access systems, nearby destinations and facilities.
- Nature of the area or projects nearby and their effects on the site (micro & macro climates on built form)

Site Topography

- Geology, Soil and Hydrology
- Understanding Contours
- Cut and fill Techniques
- Site Leveling
- Pattern of landforms –typology, slopes, circulation possibilities, access point, barrier and visibility
- Unique features

Water

- **E**xisting water bodies
- Natural and man-made drainage channels
- Surface drainage pattern
- Water supply location

Vegetation

- Dominant plant
- General pattern of plant cover

Climate

- Local pattern of wind direction, wind rose, speed and sun angles
- Local microclimates
- Ambient air qualities, sound levels

Sensory qualities

- Character and relationship of visual spaces
- Quality and variation of light

MODULE - II

Site and zoning

- Zoning classification i.e, land use zoning
- Set-backs,
- Height restrictions,
- FSI and FAR
- Incentive zoning
- Open spaces
- Open space ratio
- Pedestrian and Vehicular circulation
- On – Off street parking requirements
- Water front access plan
- Water front area, bulkhead line, shoreline
- Waterfront Public Access Area

Man Made Structures.

- Existing buildings and Siting
- Co-relation between Site form and Infrastructure
- Neighborhood context
- Location, outline, type, circulation pattern, streets, roads, alleys, sidewalks, and plazas

MODULE – III

Infrastructure Analysis Electrical

- DG Set Types
- Transformers Types
- Over Head Transmission lines
- Underground Transmission lines
- Earthing systems & Lighting arrester
- Server rooms
- Control room
- Street lights & Solar plates
- Outdoor Lighting

MODULE – IV

Plumbing Indoor

- Indoor water supply network
- Drainage network

Outdoor

- Irrigation Systems
- External Drainage System
- Storm Water Management
- Roof Water Harvesting
- Gray Water Systems
- Sewage Treatment Plant
- On Site Sewage Disposal

MODULE – V

Mechanical

- Location of Pump rooms

Economic footprint has to be considered and evaluated for all.

- Site Appraisal and Analysis of the site are to be prepared and assessed based on UDA guidelines and National Building Codes.

Text Books:

1. R Gene Brook: Site planning, environment, process and development - TSS, NBC
2. Kevin Lynch: Site Planning - Premier on Problem Seeking
3. Michael Laurie: An introduction to landscape architecture

Reference Books:

1. Tom Turner: Landscape Planning
2.K. Bhattarcharjee: Landscape Gardening & Design with Plants.

BT21B3K1 SKILL ENHANCEMENT COURSE-1

SEMESTER	Course Code	Course Title	L	T	P/S /F	C	Int. Marks	Ext. Marks	Total Marks
III	BT21B3K1	Python Programming	-	-	2	2	100	-	100

COs	Course Outcomes	POs	BTLs
	The student will be able		
CO1	To understand the basics of Python	2	2,3
CO2	To Comprehend Types, Operators and Expressions	2	2,3
CO3	To Understand the Data Structures	2	2,3
CO4	To Understand the Functions..	2	2,3
CO5	To Develop Modules, python Packages and Object-Oriented Programming in OOP in Python	2	2,3
CO6	To understand Error and Exceptions, Brief Tour of the Standard Library	2	2,3

MODULE – I

Introduction: History of Python, Need of Python Programming, Applications Basics of Python Programming Using the REPL(Shell), Running Python Scripts, Variables, Assignment, Keywords, Input Output, Indentation.

MODULE - II

Types, Operators and Expressions: Types - Integers, Strings, Booleans; Operators- Arithmetic Operators, Comparison (Relational) Operators, Assignment Operators, Logical Operators, Bitwise Operators, Membership Operators, Identity Operators, Expressions, and order of evaluations Control Flow- if, if-else, for, while, break, continue, pass.

MODULE – III

Data Structures: Lists - Operations, Slicing, Methods; Tuples, Sets, Dictionaries, Sequences. Comprehension.

MODULE – IV

Functions: Defining Functions, Calling Functions, Passing Arguments, Keyword Arguments, Default Arguments, Variable-length arguments, Anonymous Functions, Fruitful Functions (Function Returning Values), Scope of the Variables in a Function - Global and Local Variables

MODULE – V

Modules: Creating modules, import statement, from. Import statement, name spacing. **Python packages**: Introduction to PIP, Installing Packages via PIP, Using Python Package. Object Oriented **Programming OOP in Python:** Classes, 'self-variable', Methods, Constructor Method, Inheritance, Overriding Methods,

Data hiding.
MODULE – VI
Error and Exceptions: Difference between an error and Exception, Handling Exception, try except block, Raising Exceptions, User Defined Exceptions. **Brief Tour of the Standard Library -** Operating System Interface - String Pattern Matching, Mathematics, Internet Access, Dates and Times, Data Compression, Multithreading, GUI Programming, Turtle Graphics

Text Books:

1. Python Programming: A Modern Approach, Vamsi Kurama, Pearson
2. Learning Python, Mark Lutz, Orielly

Reference Books:

1. Think Python, Allen Downey, Green Tea Press
2. Core Python Programming, W. Chun, Pearson.
3. Introduction to Python, Kenneth A. Lambert,

BT21B3C1 BASICS OF ELECTRICAL ENGINEERING

SEMESTER	Course Code	Course Title	L	T	P/S/F	C	Int. Marks	Ext. Marks	Total Marks
III	BT21B3C1	Basics of Electrical Engineering	2	2	-	3	50	50	100

COs	Course Outcomes	POs	BTLs
	The student will be able		
CO1	Students will gain knowledge regarding the various laws and principles associated with electrical systems.	2	2,3
CO2	Students will gain knowledge regarding electrical basic elements like RLC, DC Networks theorems. AC circuits, DC generators & motors	2	2,3
CO3	Students will gain knowledge regarding Electric magnetization characteristics and different types of force of electromagnets	2	2,3
CO4	Students will gain knowledge regarding electrical AC source, RLC characteristics.	2	2,3
CO5	Students will gain knowledge regarding electrical AC &DC machines and applications	2	2,3
CO6	Students will gain knowledge regarding types of electrical power Generation.	2	2,3

MODULE – I

Introduction to Electrical Engineering:
Essence of electricity, Conductors, semiconductors and insulators (elementary treatment only); Electric field; electric current, potential and potential difference, electromotive force (EMF), electric power, ohm's law, basic circuit components, electromagnetism related laws, Magnetic field due to electric current flow, force on a current carrying conductor placed in a magnetic field, Faradays laws of electromagnetic induction. Types of induced EMF's, Kirchhoff's laws, Simple problems.

MODULE - II

Network Analysis:
Basic definitions, types of elements, types of sources, resistive networks, inductive networks, capacitive networks, series parallel circuits, star delta and delta star transformation, Network Theorems- Superposition, Thevenins, Maximum power transfer theorems and simple problems.

MODULE – III

Magnetic Circuits:
Basic definitions, analogy between electric and magnetic circuits, magnetization characteristics of Ferro magnetic materials, self-inductance and mutual inductance, energy in linear magnetic systems, coils connected in series, attracting force of electromagnets

MODULE – IV

Alternating Currents:

Principle of ac voltages, waveforms and basic definitions, relationship between frequency, speed and number of poles, root mean square and average values of alternating currents and voltage, form factor and peak factor, phasor representation of alternating quantities, the J operator and phasor algebra, analysis of ac circuits with single basic network element, single phase series circuits, single phase parallel circuits, single phase series parallel circuits, power in ac circuits.

MODULE – V

Dc Machines:

Principle of operation of DC generator – EMF equation - Types of DC machine – Torque equation – Applications.

Transformers:

Principles of operation, Constructional Details, Ideal Transformer and Practical Transformer, Losses, Transformer Test, Efficiency and Regulation Calculations (All the above topics are only elementary treatment and simple problems).

A**C Rotating Machines:**

Principle of operation and construction of alternators– Types of alternators – Principle of operation of synchronous motor - Principle of operation of 3-Phase induction motor – Slip-torque characteristics - Efficiency –Applications.

Basic Instruments: MC, MI instruments, dynamometer wattmeter, digital energy meter.

MODULE – VI

Power generation:

Elements of power system, layout of thermal, hydro and nuclear power plants. Introduction to renewable energy sources and recent trends in generation.

Text Books:

1. Basic Electrical Engineering, by M.S. Naidu and S. Kamakshiah :Tata McGraw-Hill Education,1995.
2. Basic Electrical Engineering, by T.K. Naga sarkar and M.S. Sukhija: Oxford University Press.
3. Theory and Problems of Basic Electrical Engineering by D.P.Kothari & I.J. Nagrath: PHIL earning Pvt. Ltd.1998
4. Principles of Electrical Engineering by V.K Mehta: S.Chand Publications..

Reference Books:

1. Essentials of Electrical and Computer Engineering by David V. Kerns, JR. J. David Irwin Pearson: Pearson; 2nd edition ,2004
2. Electronic Devices & Circuit Theory, by R. L. Boylestad & Louis Nashlesky : Pearson Education
3. Basic Electronics- Devices, Circuits and IT Fundamentals, by SantiramKal : Prentice Hall, India Electronic Devices and Circuits, by David A. Bell : Oxford University Press 2008.

BT21B3C2 FUNDAMENTALS OF STRUCTRURAL SYSTEMS

SEMESTER	Course Code	Course Title	L	T	P/S/F	C	Int. Marks	Ext. Marks	Total Marks
III	BT21B3C2	Fundamentals of Structural systems	3	-	-	3	50	50	100

COs	Course Outcomes	POs	BTLs
	The student will be able		
CO1	To understand and recapitulate basics of structural mechanics concepts.	1,4	2,4
CO2	To understand the concept on fundamentals of structures.	1	2,4
CO3	To understand the concept on fundamentals of forces and structural systems.	1,2,4	2,3
CO4	To understand and analyse the concept of stresses in beams	1,2	2,3,4
CO5	To understand the concepts of torsion of circular shafts.	1,2	2,3
CO6	To understand the concepts of columns and struts.	1,2,4	2,3

MODULE – I

Basics of Structural Mechanics

Forces, system of forces, resultant, equilibrant Parallelogram law, Triangle law, Lamis Theorem, polygonlaw, resultant of coplanar, concurrent force system, couple, characteristics of couple, moment, Equilibrium Stress, Strain, type of stresses, stress-strain curve for ductile Material, Hooke's law, Modulus of Elasticity, Shear stress, types of Strain, poissons Ratio, Shear modulus Bulk Modulus.

MODULE – II

Fundamentals of structures

Construction and form, Structure and Form. Geometry of form and structural function. Introduction to basic structural systems, elements of structure, their functions &behavior, beams, slabs, columns, walls, foundations, bearing wall systems, trusses, rigid frames, linear and curved elements; simply supported, cantilever and overhanging beams for various loads; effect of simple geometric forms on the overall structural behavior.

MODULE – III

Fundamentals of Forces

Primary and secondary forces acting on structures - dead loads, live load, wind, seismic forces, distribution of loads through the elements of the system.

Structural Systems:

Single and double layer grids; braced domes, ribbed domes, plate type domes, Network domes, Lamella domes, Geodesic domes, Grid domes. Braced and folded structures.

MODULE – IV

Stresses in beams (Bending, Shear)

i. Bending; Theory of simple bending, Bending moment equation, Determination of moment of inertia ofcross sections of various shapes, section modulus, Moment of resistance, bending

stresses in solid, hollow and built up section. ii. Shear: Distribution of shear stresses on beam cross sections, iii.Strain energy under uniaxial tension and compression shear bending and torsion impact loads and instantaneous stresses.
MODULE – V
Torsion Of Circular Shafts– Theory of pure torsion – Derivation of Torsion equations : T/J = q/r = Ne/l – Assumptions made in the theory Theory of pure torsion – Torsional moment of resistance – Polar section modulus – Power transmitted by shafts – Combined bending and torsion and end thrust – Design of shaftsaccording to theories of failure
MODULE – VI
Columns And Struts: Introduction Types of columns – Short, medium and long columns – Axially loaded compression members – Crushing load – Euler's theorem for long columns – assumptions.

Text books:

1. Strength of Materials vol – I, by B.C. Punmia: Laxmi Publications pvt. Ltd

2. Strength of Materials by R.S Kurmi S .Chand Publications.

3. Mechanics of Materials, by E.P.Popov: Prentice Hall of India, New Delhi

Reference Books:

4. Development of Structural Form, by Rowland J. Mainstone:Taylor & Francis Group, 2001.

5. Engineering Materials, by Rangwala: Anand, 1993.

6. Building Construction, by S. P. Bindra, S. P. Arora: Dhanpat Rai Publications.

BT21B3C3 THERMODYNAMICS

SEMESTER	Course Code	Course Title	L	T	P/S/F	C	Int. Marks	Ext. Marks	Total Marks
III	BT21B3C3	Thermodynamics	2	2	-	3	50	50	100

COs	Course Outcomes	POs	BTLs
	The student will be able		
CO1	To understand the basic parameters of thermodynamics and Zeroth law	1	1,2
CO2	To understand how heat helps in carrying out work, basic difference between the heat and mechanical work, derivation of work equations in various processes	1,2	2,3
CO3	To understand I law of thermodynamics, steady flow energy equation derivation, applications.	1,2,3	2,3,5
CO4	To understand the behavior of gases and pure substances along with P- T,T-S diagrams	1,4	2,4
CO5	To understand the working of heat pump, heat engine and study the Carnot cycle and derive the equation for COP	1,2	2,3
CO6	To understand II law of thermodynamics, concept of entropy, availability and irreversibility	1,2	2,3

MODULE – I

Fundamental Concepts & Definitions:

Thermodynamics: Terminology; definition and scope, microscopic and macroscopic approaches. Engineering Thermodynamics: Definition, some practical applications of engineering thermodynamics. System (closed system) and Control Volume (open system); Characteristics of system boundary and control surface; surroundings; fixed, moving and imaginary boundaries, examples. Thermodynamic state, state point, identification of a state through properties; definition and units, intensive and extensive various property diagrams, path and process, quasi-static process, cyclic and non-cyclic processes; Restrained and unrestrained processes; Thermodynamic equilibrium; definition, mechanical equilibrium; dia-thermic wall, thermal equilibrium, chemical equilibrium. Zeroth law of thermodynamics. Temperatureas an important property.

MODULE – II

Work and Heat:

Mechanics - definition of work and its limitations. Thermodynamic - definition of work and heat, examples, sign convention. Displacement works at part of a system boundary and at whole of a system boundary, expressions for displacement works in various processes through p-v diagrams. Shaft work and Electrical work. Other types of work. Examples and practical applications.

MODULE – III

First Law of Thermodynamics:

Statement of the First law of thermodynamics for a cycle, derivation of the First law of processes, energy, internal energy as a property, components of energy, thermodynamic distinction between

energy and work; concept of enthalpy, definitions of specific heats at constant volume and at constant pressure. Extension of the First law to control volume; steady state-steady flow energy equation, important applications such as flow in a nozzle, throttling, adiabatic mixing etc., analysis of unsteady processes, case studies.

MODULE – IV

Pure Substances & Steam Tables and Ideal & Real Gases:

Ideal and perfect gases: Differences between perfect, ideal and real gases, equation of state, evaluation of properties of perfect and ideal gases. Real Gases: Introduction. Vander Waal's Equation of state, Vander Waal's constants in terms of critical properties, law of corresponding states, compressibility factor; compressibility chart, and other equations of state (cubic and higher orders). Pure Substances: Definition of a pure substance, phase of a substance, triple point and critical points, sub-cooled liquid, saturated liquid, vapor pressure, two-phase mixture of liquid and vapor, saturated vapor and superheated vapor stateof a pure substance with water as example. Representation of pure substance properties on p- T and p-V
diagrams, detailed treatment of properties of steam for industrial and scientific use (IAPWS- 97, 95)

MODULE - V

Basics of Energy conversion cycles:

Devices converting heat to work and vice versa in a thermodynamic cycle Thermal reservoir. Heat engineand a heat pump; schematic representation and efficiency and coefficient of performance. Carnot cycle.

MODULE - VI

Second Law of Thermodynamics:

Identifications of directions of occurrences of natural processes, Offshoot of II law from the I. Kelvin-Planck statement of the Second law of Thermodynamic; Clausius statement of Second law of Thermodynamic; Equivalence of the two statements; Definition of Reversibility, examples of reversible and irreversible processes; factors that make a process irreversible, reversible heat engine; Evolution of Thermodynamic temperature scale.

Entropy:

Clausius inequality; statement, proof, application to a reversible cycle. (δQR/T) as independent of the path. Entropy; definition, a property, principle of increase of entropy, entropy as a quantitative test for irreversibility, calculation of entropy, role of T-s diagrams, representation of heat, Tds relations, Available and unavailable energy.

Availability and Irreversibility:

Maximum useful work for a system and a control volume, availability of a system and a steadily flowing stream, irreversibility. Second law of efficiency.

Text books:

1. Heat Engineering, by DrVasandani and Dr Kumar: Metropolitan Book Co. Pvt. Ltd., Delhi.
2. Thermal Engineering, by Khurmi S Chand Publishers.
3. Engineering Thermodynamics: Work and Hest Transfer, by Rogers and Mayhew; ELBSPublications.

Reference Books:

4. Thermodynamics and Heat Engines Vol. I and II, by R Yadav: Central Publishers, Allahabad.
5. Thermodynamics by Khurmi S Chand Publishers
6. Steam Turbine Theory and Pratice, by WAJ Keartan: ELBS Series
7. Applied Thermodynamics by TD Eastop& A McConkey: ELBS Publications 2003.

BT21B3C4 WATER SUPPLY & WASTE WATER SYSTEMS

SEMESTER	Course Code	Course Title	L	T	P/S /F	C	Int. Marks	Ext. Marks	Total Marks
III	BT21B3C 4	Water Supply & Waste Water Systems	3	-	-	3	50	50	100

COs	Course Outcomes	POs	BTLs
	The student will be able		
CO1	To make the students conversant with sources and its demand of water	6,7	1,2
CO2	To provide adequate knowledge about the water treatment processes	4,7	1,3
CO3	Identify and summarize the arrangement of water supply and fittings in a building and determine the need of conservation of water	5,7	1,3
CO4	Identify and assess the characteristics of wastewater and TreatmentProcesses	6,7	1,2
CO5	To Understanding the drainage system and building sanitation.	4,7	1,3
CO6			

MODULE – I

Sources of water supply

Hydrological concepts, Definition, Precipitation, Infiltration, Run off, Evaporation, Transpiration, **Surface sources**, Natural ponds and lakes, Streams and rivers, Impounding reservoirs, Sub surface sources, Infiltration galleries, Infiltration wells, Springs, Wells, Intakes for collecting surface water

Importance and Necessity for planned water supplies, wholesome water, Status of protected water supply in India, Planning and Execution of Modern water supply schemes.

Water Demands

Various types of water Demands, Domestic Demand, Industrial Demand, Institutional and commercial water demand, Demand for Public uses, Fire demand, Losses and wastes, Per capita demand,

Factors affecting per capita demand, Variations in demand, Seasonal variations, Daily variations, Hourly variations, Design Period, Total requirement of water for a town or a city,

Population forecasting methods and problems, Arithmetical increase method, Geometrical increase method, Incremental increase method, etc.

MODULE - II

Water treatment plant: Components& basic design parameters (flow diagram, Screening, aeration, Sedimentation, Coagulation, Flocculation, Filtration, Disinfection and Distribution)

Distribution System

Layouts of Distribution Networks, Dead end system, Grid iron system, Ring system, Radial system,
Systems of Distribution, Gravitational system Pumping system, Combined system,

Types of pumps and their suitability, Centrifugal pumps – Components, Selection of pump horse power, Operation and maintenance, Trouble Shooting,
Requirement of pipe materials, Different types of pipes, Laying and Testing, Maintenance, Pipe Corrosion - Causes and Prevention.

Appurtenances in the distribution system
Understand the various appurtenances in a distribution system, use of, Sluice valves, check valves or reflux
valves, Air valves, drain valves or blow off valves, Scour valve, Water meter, Fire Hydrants etc.,

MODULE – III

Water supply plumbing systems in buildings

Plumbing System in Water Supplies, The House Water Connection, Stop Cocks, Water taps andBib cocks, Pipe fittings, Storage of water in buildings, Estimating Storage Capacity, Overhead Storage, Underground Storage tanks, Types of tanks, RCC, GI and HDPE tanks, General requirements of domestic water storage, Water piping systems in building, Piping system using direct supply, Piping system using overhead tanks, Piping system using underground - overhead tank supply, Pumped systems, NBC codes For Discharge(Q) Vs Cross Section of Pipe(D) in Plumbing.

Water Efficient Design

Rain Water Harvesting**,** Rain water Harvesting structures, Rain water directed to Service wells, Rain water harvesting by percolation pit method, Low water fixtures-Gravity-Fed Low Flow, Pressure- Assisted Low Flow.

MODULE – IV

Introduction

Definition Of Terms - Sullage, Sewage, sewer and sewerage, Classification of sewage, Systems of sewage disposal,

Types of sewerage systems and their suitability separate, combined and partially separate systems. Natural **Wastewater Treatment Systems** - Ponds and Lagoons, Wetlands and Root-zone systems Surface and Ground Water Treatment for Potable Water Supply.;

Quantity of discharge in sewers, dry weather flow, variability flow, Determination of storm water flow

Sewage Characteristics

Strength of sewage, sampling of sewage, characteristics of sewage, physical, chemical and biological Analysis of Sewage - significance of the following tests. 1. Solids, 2. C.O.D, 3. B.O.D, 4. PH- value, 5 Chlorides (No details of tests)

MODULE – V

Drainage and sanitation in Buildings

Aims of building drainage and its requirements - General layout of Sanitary fittings to a house, drainage arrangements for a single and multi-storied buildings as per IS code of practice

Sanitary fittings - traps, water closets, flushing cisterns, urinals, inspection chambers,anti siphonage inspection, testing and maintenance of sanitary fittings

Sewer Appurtenances - Brief description, location, function and construction of, Manholes, Drop Manholes, Street inlets, catch basins, Flushing tanks, Regulators Inverted siphon, Necessity of pumping sewage - location and component parts of pumping station.

MODULE – VI

Solid Waste Management & Waste Water Treatment

Sources, Engineering classification, Characterization, Generation and Quantification. Transport - collection systems, collection equipment.
Treatment methods: Methods of refuse processing, recovery, recycle and reuse, composting – aerobic and anaerobic, incineration, pyrolysis and energy recovery. Disposal methods: Impacts of open dumping, site selection, sanitary land filling – design criteria and design examples, leachateand gas collection systems, leachate treatment).

Sewage treatment and disposal

Preliminary treatment - Brief description and functions of the following units 1. Screens, 2. Skimming tanks and 3. Grit chambers, 4. Plain sedimentation**.**

Secondary treatment - Brief description of 1. Trickling filters, 2. Activated sludge process., Septic tank, Sewage disposal - dilution, disposal on to lands, groundwater recharge, reuse etc.**,**

Water Recycling, Course filter and surge tank, Sand filters with reeds, UV disinfection, Grey Water and Rainwater Sources and End Uses, Potential End Use After Treatment, Grey Water Treatment, Grey Water Collection and Sand water Pipe work.

Text books:

1. Environmental Engineering, by Peavy, Rowe and Tchobanoglous: McGraw-Hill 1984
2. Water Supply Engineering Environmental Engineering Vol.-I, by Garg, SK: Khanna Publishers, New Delhi, 2005
3. Water Supply and Treatment, by Kshirsagar: Roorkee Publishing House, Roorkee
4. Water Supply and Wastewater Engineering, by Punmia: Laxmi Publishers, New Delhi.

Reference Books:

5. Water Supply and Wastewater Engineering, by Raju: Tata McGraw hill, New Delhi
6. Water Supply and Sanitary Engineering, by Birdie: Dhanpat Rai Publishers.
7. Water Supply and Sewerage, by Steel and McGhee: McGraw-Hill 1991.

BT21B3C5 BUILDING TECHNOLOGY-I

SEMESTER	Course Code	Course Title	L	T	P/S/F	C	Int. Marks	Ext. Marks	Total Marks
III	BT21B3C5	Building Technology-I	2	2	-	3	50	50	100

COs	Course Outcomes	POs	BTLs
	The student will be able		
CO1	To study about the basic applications.		
CO2	To learn about Carpentry and Joinery, Foundations, Masonry Construction	1,3,7	2,5
CO3	To know the Masonry Construction, Arches and Lintels, Ground and upper floors.	1,3,7	2,4,5
CO4	Study the various Vertical Transportation	1,3	2,4,5
CO5	To learn about Building Finishes, Distempering Finishes	1,3	2,4,5
CO6	To learn about Miscellaneous Structures	1,3,7	2,4,5

MODULE – I

Functional Planning Of BuildingIntroduction

Manmade environment, general principles for site selection, site plan, planning regulation and by-laws principles of planning, orientation of buildings, basic components and their basic requirements of building.Soils, their investigation and testing: general discussions on soils, soil investigations, testing on soils for
bearing capacity.

MODULE – II

Carpentry and Joinery:

Terms defined; mitring, grooving, rebating, veneering. Various forms of joints in wood work, such alengthening joints, bearing joints, halving, dovetailing, housing, notching, tusk and tenon etc.

Foundations:

Types of foundations and general procedure in foundation design

Masonry classifications- stone, brick, hollow concrete, reinforced, composite masonry.

MODULE – III

Masonry Construction:
Advantages of tall buildings, problems of tall buildings, concept of framed structure its advantages, partition walls.

Arches and Lintels:
Arches and their stability considerations, technical terms in arch work, types of arches, method of construction of arches, types of lintels

Ground and upper floors: selection of flooring for ground floors, construction of ground floors, choice of construction for upper floors.

MODULE – IV

Vertical Transportation:

Stair case, elevators of lifts, ramps, escalators, dumbwaiter, vertical conveyors.

Doors and Windows:

Definitions of technical terms, installation of door and window frames and their specifications, types ofdoors, windows and their classification-fixtures and fastening for doors and windows

Roofs and Roof Coverings:
Sloping roof and roof trusses, pitched roof or sloping roofs, flat roofs or terrace roofs, shell roofs, domes.
Partition Walls:

Brick partition, reinforced brick partition, brick nogged partition, lath and plaster partition, pre-cast concretepartition, glass block and glass Crete partition, common wooden partition, and trussed partition.

MODULE – V

Building Finishes: Plastering, pointing, white-washing, color washing.
Distempering Finishes: Paints, varnishes, distemper.

MODULE – VI

Miscellaneous Structures:

Structures-shell, folded plate, tension, skeletal frame, pneumatic, prefabricated structures, fireplaces andflues, earthquake resistant structures.

Materials for Special Treatments:

Fire resistant, waterproofing, thermal insulation, acousticaltreatment and anti-termite treatment.

Text books:

1. Building construction by S.P.Arora, S.P.Bindra, 19th edition, Dhanpat rai publications. NewDelhi 2000.
2. Building construction by Rangwala S.C, 22nd edition charoter publication house, Anand 2004.

Reference Books:

1. Elementary building construction, by Moxley, R.Mitchell's, Technical press ltd.
2. Fundamental Building Technology by Andrew J.Charlett and Craig Maybery-Thomas, 2nd EditionRoutledge publications.

BT21B3E1 RENEWABLE ENERGY SOURCES

SEMESTER	Course Code	Course Title	L	T	P/S/F	C	Int. Marks	Ext. Marks	Total Marks
III	BT21B3E1	Renewable EnergySources	3	-	-	3	50	50	100

COs	Course Outcomes	POs	BTLs
	The student will be able		
CO1	To acquire the knowledge on various renewable energy generation scenario in India.	1,2,4	2,3
CO2	To understand various types of solar energy system and their fundamentals and Solar-Electric Power generation.	1,2,4	2,3
CO3	To Acquire knowledge on Design wind energy types.	1,2,4	2,3
CO4	To acquire the knowledge on wind energy generation.	1,2,4	2,3
CO5	To Acquire knowledge on Design of Ocean Thermal Energy Conversion.	1,2,4	2,3
CO6	To acquire the knowledge on Energy Storage and hybrid system configurations	1,2,4	2,3

MODULE – I

Introduction
World Energy Use – Reserves of Energy Resources – Environmental Aspects of Energy Utilization – Renewable Energy Scenario in India and around the World – Potentials – Achievements / Applications – Economics of renewable energy systems in small and large scale buildings.

MODULE - II

Fundamentals of Solar Energy-Solar spectrum- Solar Radiation on Earth's surface-Solar radiation geometry-Solar radiation measurements- Solar radiation data- Solar radiation on horizontal and tilted surfaces. Solar Thermal conversion- Flat plate collectors- concentrated collectors- construction and thermal analysis- Solar applications- Solar ponds- Heliostat systems-water heater-air heater-solar still.

Solar-Electric Power generation- Photovoltaic cells- Equivalent circuit- V-I Characteristics Photovoltaic modules – constructional details- design considerations- Tracking- Maximum power point tracking - Solar Thermo electric conversion.

MODULE – III

Wind Energy- Fundamentals of wind energy-power available in wind- Betz Limit Aerodynamics of windturbine- Wind turbines- Horizontal and vertical axis turbines –their configurations- Wind Energy conversion systems.

MODULE – IV

Energy from Bio Mass- Various fuels- Sources-Conversion Technologies-Wet Processes – Dry Processes- Bio Gas generation – Aerobic and anaerobic digestion. Generation of bio gas - Classification of bio gas plants-Different Indian digesters- Digester design considerations - Gasification process - Gasifiers – Applications. Geothermal Energy - sources-
Hydrothermal convective - Geo-pressure resources - Petro-thermal systems (HDR) - Magma

Resources- Prime Movers.
MODULE – V
OTEC Systems- Principle of operation - Open and closed cycles, Energy from Tides - Principle of Tidal Power - Components of tidal Power plants - Operation Methods - Estimation of Energy in Single and double basin systems - Energy and Power from Waves Wave energy conversion devices - Fuel Cells -Design and Principle of operation - Types of Fuel Cells - Advantages and disadvantages - Types of Electrodes – Applications - Basics of Batteries - Constructional details of Lead acid batteries - Ni-Cd Batteries.
MODULE – VI
Energy Storage and hybrid system configurations: Energy storage: Battery - types, equivalent circuit, performance characteristics, battery design, chargingand charge regulators. Battery management. Fly-wheel energy relations, components, benefits over battery. Fuel Cell energy storage systems. Ultra Capacitors.

Text books:

1. "John Twidell & Wier", "Renewable Energy Resources", CRC Press, 2009.
2. "G. D. Rai", "Non Conventional Energy sources", Khanna publishers, 2004
3. "D. P .Kothari, Singal, Rakesh and Ranjan", "Renewable Energy sources and EmergingTechnologies", PHI, 2009.
4. "F. C. Treble", Generating Electricity from Sun, Pergamon Press, 1st Edition 1991
5. "C. S. Solanki", "Solar Photovoltaics - Fundamentals- Principles and Applications", PHI, 2009
6. "S. P. Sukhatme", "Solar Energy Principles and Application", TMH, 2009.

Reference Books:

1. A.K.Mukerjee and Nivedita Thakur," Photovoltaic Systems: Analysis and Design", PHILearning Private Limited, New Delhi, 2011
2. Richard A. Dunlap," Sustainable Energy" Cengage Learning India Private Limited, Delhi, 2015.
3. Chetan Singh Solanki, " Solar Photovoltaics : Fundamentals, Technologies and Applications",PHI Learning Private Limited, New Delhi, 2011
4. Bradley A. Striebig,Adebayo A.Ogundipe and Maria Papadakis," Engineering Applications inSustainable Design and Development", Cengage Learning India Private Limited, Delhi, 2016.
5. Godfrey Boyle, "Renewable energy", Open University, Oxford University Press in associationwith the Open University, 2004.
6. Shobh Nath Singh, 'Non-conventional Energy resources' Pearson Education ,2015.

BT21B3E2 ADVANCED SURVEYING

SEMESTER	Course Code	Course Title	L	T	P/S/F	C	Int. Marks	Ext. Marks	Total Marks
III	BT21B3E2	Advanced Surveying	3	-	-	3	50	50	100

COs	Course Outcomes	POs	BTLs
	The student will be able		
CO1	To analyze the basic concepts and principles of Theodolite in most of engineering projects before planning and during execution.	1,4,9	1,3
CO2	To learn the basic concepts and principles of Trigonometric Levelling.	1,4,9	1,3
CO3	To learn the working principles and use of Tachometric survey.	1,4,9	1,3
CO4	To understand various elements of a simple curve.	1,4,9	1,3
CO5	To Apply the knowledge of Total Station in different field activities.	1,4,9	1,3
CO6	To understand the basic principles of Remote Sensing and GIS.	1,4,9	1,3

MODULE – I

Theodolite Surveying: Principles of Theodolite surveying - Component parts of Theodolite –Technical terms used in Theodolite surveying - Fundamental lines and relationship between fundamental lines - Temporary adjustments- Measurement of horizontal angles by repetition and reiteration method - Measurement of vertical angles - Errors in Theodolite surveying -Theodolite traversing by included angle method and deflection angle method - Checks for closed and open traverse - Traverse computations, Latitude, Departure, closing error - balancing a closed traverse by Bowditch and Transit rules only – Area of closed traverse (Independent Co-ordinates method only).

MODULE – II

Trigonometric levelling: Trigonometric Levelling - Principle - Necessity -Elevations and distance of objects whose base is accessible and whose base is inaccessible with instrument stations in same vertical plane and different vertical planes.

MODULE - III

Tachometric Surveying: Principle of tachometry - Methods of tachometry - Uses of tachometry compared to a theodolite - Stadia Tachometry with staff held vertical and line of collimation horizontal or inclined - Elevations and distances of staff stations - Determination of Tachometric constants - TangentialTachometry: Finding elevations- Problems.

MODULE – IV

Elements of Simple Curves: Types of curves - Advantages and application – De signation of curve - Relationship between radius and degree of curve - Simple circular curve - elements of simple curve.

MODULE – V

Total Station: Principle and uses of Electronic Distance Measurement, Parts and functions – setting up total station for taking observations –Advantages and Disadvantages of Total Station - Measurement of distances and angles - multiple number of observations on a single station - measurement of

area with single station setup – Traversing using a total station - orientation of total station by resection method.
MODULE – VI
Remote Sensing& GIS: Introduction, Principle of Remote sensing, EM Radiation and the atmosphere, interaction of EM radiation with Earth's surface, remote sensing observation platforms, sensors, applications of remote sensing. Geographical Information System: Introduction and principle of Geographical Information System, components of GIS, applications.

Text Books:

3. Dr. K.R. Arora, Surveying Vol-1 & Vol-2, Thirteenth Edition, Standard Book House, 2015
4. Dr. B.C. Punmia, Er. Ashok K. Jain and Dr. Arun K. Jain., Surveying Vol-1 & Vol-2,Sixteenth Edition, Laxmi Publications (P) Ltd., 2005.
5. Surveying and Levelling by N. N. Basak

Reference Books:

1. R. Subramanian, Surveying and levelling, Second Edition, Oxford University press, 2012.
2. S. K. Duggal., Surveying Vol-1, Fourth edition, McGraw Hill., 2013.

S. S. Bhavikatti, Surveying and Levelling Vol-1, I. K. International Publishing House Pvt. Ltd.,

BT21B3O1 ELECTRICAL ESTIMATION AND COSTING

SEMESTER	Course Code	Course Title	L	T	P/S/F	C	Int. Marks	Ext. Marks	Total Marks
III	BT21B3O1	Electrical Estimation and Costing	2	-	-	2	100	-	100

COs	Course Outcomes	POs	BTLs
	The student will be able		
CO1	Students will gain knowledge regarding the various laws and principles associated with electrical systems.	2	2,3
CO2	Students will gain knowledge regarding electrical basic elements like RLC, DC Networks theorems. AC circuits, DC generators & motors	2	2,3
CO3	Students will gain knowledge regarding Electric magnetization characteristics and different types of force of electromagnets	2	2,3
CO4	Students will gain knowledge regarding electrical AC source, RLC characteristics.	2	2,3
CO5	Students will gain knowledge regarding electrical AC &DC machines and applications	2	2,3
CO6	Students will gain knowledge regarding types of electrical power Generation.	2	2,3

MODULE – I

Introduction to Electrical Engineering:
Essence of electricity, Conductors, semiconductors and insulators (elementary treatment only); Electric field; electric current, potential and potential difference, electromotive force (EMF), electric power, ohm's law, basic circuit components, electromagnetism related laws, Magnetic field due to electric current flow, force on a current carrying conductor placed in a magnetic field, Faradays laws of electromagnetic induction. Types of induced EMF's,
Kirchhoff's laws, Simple problems.

MODULE – II

Design Considerations of Electrical Installations:
Electric Supply System, Three Phase four wire distribution system, Protection of Electric Installation against over load, short circuit and Earth fault, Earthing, General requirements of Electrical Installations, testing of installations, Indian Electricity rules, Neutral and Earth wire, Types of loads, Systems of wiring, Service connections, Service Mains, Sub-Circuits, Location of Outlets, Location of Control Switches, Location of Main Board and Distribution Board, guide lines for Installation of Fittings, Load Assessment, Permissible voltage drops and sizes of wires, estimating and costing of Electrical installations.

MODULE – II

Electrical Installation of Buildings and Small Industries:
Electrical installations for residential buildings – estimating and costing of material, Electrical installations for commercial buildings, Electrical installations for small industries.

MODULE – IV

Overhead and Underground Transmission and Distribution Lines: Introduction, Supports for Transmission lines, Distribution lines – Materials used, Underground cables, Mechanical Design of overhead lines, Design of underground cables.
MODULE – V
Substations: Introduction, Types of substations, Outdoor substation – Pole mounted type, Indoor substation, Floor mounted type.
MODULE – VI
Design of Illumination Schemes: : Introduction, Terminology in Illumination, laws of illumination, various types of light sources, Practical lighting schemes.

TEXT BOOKS:

1. Electrical Design Estimating and Costing, K.B. Raina, S.K. Bhattacharya, New Age InternationalPublisher.
2. Design of Electrical Installations, Dr. V.K. Jain, Dr. Amitabh Bajaj, University Science Press.
3. Electricity pricing Engineering Principles and Methodologies, Lawrence J. Vogt, P.E., CRCPress.

REFERENCE BOOKS:

1. Guide for Electrical Layout in residential buildings, Indian Standard Institution, IS:4648-1968
2. Electrical Installation buildings Indian Standard Institution, IS:2032.

MC21B301 INDIAN CONSTITUTION

SEMESTER	Course Code	Course Title	L	T	P/S/F	C	Int. Marks	Ext. Marks	Total Marks
III	MC21B301	Indian Constitution	1	0	0	0	-	-	-

COs	Course Outcomes	POs	BTLs
	The student will be able		
CO1	To Know the background of the present constitution of India.	6, 7	1, 2
CO2	To Understand the working of the union, state and local levels.	6, 7	1, 2
CO3	To Gain consciousness on the fundamental rights and duties.	6, 7	1, 2
CO4	To understand the functioning and distribution of financial resources between the Centre and States.	6, 7	1, 2
CO5	Be exposed to the reality of hierarchical Indian social structure andthe ways the grievances of the deprived sections can be addressed to raise human dignity in a democratic way.	6, 7	1, 2
CO6	To understand the international relations of India with the surrounding countries	6, 7	1, 2

MODULE – I

Evolution of the Indian Constitution: 1909 Act, 1919 Act and 1935 Act. Constituent Assembly: Composition and Functions; Fundamental features of the Indian Constitution.

MODULE - II

Union Government: Executive-President, Prime Minister, Council of Minister
State Government: Executive: Governor, Chief Minister, Council of Minister Local Government: Panchayat Raj Institutions, Urban Government

MODULE - III

Rights and Duties: Fundamental Rights, Directive principles of state policy, Fundamental Duties

MODULE - IV

Relation between Federal and Provincial units: Union-State relations, Administrative, legislative and Financial, Inter State council, NITI Ayog, Finance Commission of India

MODULE – V

Statutory Institutions: Elections-Election Commission of India, National Human Rights Commission, National Commission for Women

MODULE – VI

India's External Relations: Cold War and Post-Cold War era. What is Foreign Policy? Basic Determinates of Foreign Policy Indian and its Neighbors India's Extended Neighborhood in West Asia and South EastAsia. India's relations with the United States and Russia. India and the World Organizations India in the21st century

Text Books:

- D.D. Basu, Introduction to the constitution of India, Lexis Nexis, New Delhi
- Subhash Kashyap, Our Parliament, National Book Trust, New Delhi

Reference Books:

- Peu Ghosh, Indian Government &Politics, Prentice Hall of India, New Delhi
- B.Z. Fadia & Kuldeep Fadia, Indian Government &Politics, Lexis Nexis, New Delhi

SEMESTER-IV

BT21B4S1 BUILDING SERVICES STUDIO-IV

SEMESTER	Course Code	Course Title	L	T	P/S/F	C	Int. Marks	Ext. Marks	Total Marks
IV	BT21B4S1	Building Services Studio-IV	2	0	6	8	100	100	200

COs	Course Outcomes	POs	BTLs
	The student will be able		
CO1	Acquainting with the various ways of designing a plumbing system in building in urban context i.e. low/medium rise, high density, high rise etc.	1,2,3	2,4,5

MODULE – I

Study and Analysis- Through literature studies and case studies analyze the constraints, typologies and interventions in water supply and sanitation services.

Design Proposal- Design of a building project incorporating varied formats of grouping on an actual site with specific bye-laws and regulations, calculating – demand of water supply.

Integration of Plumbing Services

Water supply:

- Calculating water demand
- Capacity of sump, Overhead tank
- Pipe Network: Type and specifications, Diameter, Valves, Connections, Fire hydrants
- Pumps: Type, Power calculations, Head calculations, etc.,
- Distribution Network: Specific network for Hot water, Cold water, Treated water, Drinking water,bore water and Recycled grey water
- Fixtures: Types of fixtures, specifications and cataloguing, market survey
- Pressure calculations and Diameter of Piping
- Fountains and cascades, swimming pools, Sprinkler system, Irrigation system for gardening
- Treatment of water: Water softeners, RO plants, filters beds

Preparation of water supply layout at site level and building level, report containing calculations and specifications, catalogue reference for a gated community, resorts, hotels, hospitals, manufacturing unit, complex or office building.

Sewage system:

- Calculating STP water demand
- Location of STP, segregation and design of STP chambers
- Creating internal layout of Sanitary system
- Load calculations for Pipe sizes, Manholes, etc.,
- Pipe Network: Type and specifications, Diameter, Connections and slopes

Strom water systems:

- Calculating storm water demand

- Location of Rainwater harvesting pit
- Calculating run off coefficient for different materials
- Load calculations for: Pipe sizes, Trenches, etc.,

Pipe Network: Type and specifications, Diameter, Connections and slopes Preparation of sanitary and storm water layout at site level and building level, report containing calculations and specifications, catalogue reference for a gated community, resorts, hotels, hospitals, manufacturing unit, complex or office building.

Expected Output & Assignment:

Major design problem: Literature review, Data collection, Case study and proposal for a hospital, manufacturing unit, resorts and hotels. Any two minor design problems like commercial complex or office building.

Text books:

1. TSS(Time Sever Stranded)
2. UPC2005(Uniform Plumbing Code)
3. NBC 2005(National Building Code)

Reference Books:

4. Water Supply and sanitation by Rangwala
5. Hand book of Building Services by Hafiz contractor.

BT21B4P1 CAD AND 3DMODELING

SEMESTER	Course Code	Course Title	L	T	P/S /F	C	Int. Marks	Ext. Marks	Total Marks
IV	BT21B4P1	CAD and 3D Modeling	-	-	4	4	50	50	100

COs	Course Outcomes	POs	BTLs
	The student will be able		
CO1	Prepare, read, understand, interpret, crate and save the drawings in a professional manner.	5,10, 12	3,6
CO2	Plan and design a residential or public buildings as per the given requirements with CAD software along with basic building services layouts.	5,10, 12	3,6

MODULE – I

Basics of CAD:

Starting CAD: Introduction to the menu, creating and using templates, starting drawings with setup wizards,saving and closing a file.

Drawing tools: Lines, Circle, Arc, Polyline, Multiline, Polygon, Rectangle, Spline, Ellipse

Modifying tools: Erase, Copy, Mirror, Offset, Array, Move, Rotate, Scale, Stretch, Lengthen, Trim, Extend,Break, Chamfer and Fillet

Using Text: Single line text, Multiline text, Spelling, Edit text

Special Features: View tools, Layers concept, Dimension tools, Hatching, Customizing toolbars, working with multiple drawings.

MODULE - II

Building Drawings:

a) Site Layout Plan
b) Floor Plan
c) Foundation and Column Layout Drawings
d) Plinth Beam Layout Drawings
e) Roof beam details
f) Roof slab details
g) Flooring Details Drawings
h) Doors & Windows Frame Details
i) Sill and Lintel Level Drawings
j) Column, Beam and Slab Reinforcement Details

Staircase Layout and Reinforcement Details

Applications of CAD in Building services:

1) Plumbing Layout Drawings
2) Electrical Layout Drawings

HVAC duct Layout Drawings.

Text books:

1. Engineering Drawing with Auto CAD 2000, by Tjeyapoovan, T: Vikas Pub. House Pvt.Ltd.,New Delhi, 2000.
2. Inside Auto CA, by Daniel: New Riders Pub1987.

Reference Books:

3. Auto CAD Release 2000, by Georgeomura: Sybex Inc 1993
4. Commercial using AutoCad 2013, by Daniel Hohn Stine CSI, CDT, Schroff DevelopmentCorporation.

BT21B4K1 SKILL ENHANCEMENT COURSE-2

SEMESTER	Course Code	Course Title	L	T	P/S/F	C	Int. Marks	Ext. Marks	Total Marks
IV	BT21B4K1	Advanced communication skills	0	2	0	2	100	-	100

COs	Course Outcomes	POs	BTLs
	The student will be able		
CO1	To develop various elements of soft and effective communication skills.	9, 10, 12	2, 3, 6

MODULE – I

Advanced communication skills (including laboratory)

The student must learn **Soft skills and Advanced communication skills (including laboratory)** which can be dealt by course instructor allotted by the department head.

Suggested Input Learnings:

- **Soft skills:**
  - JAM
  - Oral Presentation
  - Group Discussion
  - Debate
  - Role Play
- **Advanced Communication Skills Laboratory:**
  - Listening Skills
  - Note Taking/Note making
  - Resume/CVV writing
  - PPT slides
  - Interview Skills- Mock Interview/ Public speaking

Note:

Marks can be awarded based on internal assessment such as submissions, performance, viva voce etc.

Total marks:100

- 50M - Day to day performance, Record, Viva, Attendance &
- 50M –{soft skills- 25M (Write up - 10M, Performance - 15M) , AELCS- 25M (Write up – 10M, Performance – 15M)}

BT21B4C1 BUILDING TECHNOLOGY-II

SEMESTER	Course Code	Course Title	L	T	P/S/F	C	Int. Marks	Ext. Marks	Total Marks
IV	BT21B4C1	Building Technology-II	3	-	-	3	50	50	100

COs	Course Outcomes	POs	BTLs
	The student will be able		
CO1	To impart an understanding of design process and provide knowledge of structural elements like RCC beam, slab, column, and footings.	1,3,7	1,5
CO2	To impart an understanding of design process and provide knowledge of Super Structure Construction for Building.	1,3,7	2,5
CO3	To impart an understanding the knowledge of Construction Of Foundation ofSpecial Structures.	1,3,7	2,4,5
CO4	To impart an understanding the knowledge of Sub Structure Construction.	1,3,7	2,4,5
CO5	To impart an understanding the knowledge of impart an understanding theknowledge of R.C. Concrete.	1,3,7	2,4,5
CO6	To impart an understanding the knowledge of Methodical approach to Repairs.	1,3,7	2,4,5

MODULE – I

Introduction to RCC: Understanding the properties and characteristics of RCC. Its advantages and disadvantages. Cast-in-situ and pre-cast constructional methods in RCC. Understanding the structural components of a typical RCC frame structure with reference to their location, junctions, load transferand design. Introduction to pre stressed concrete structures.

MODULE - II

Super Structure Construction for Building

RCC columns – different shapes, different combinations and loading conditions (axial, bending, non-axial), slenderness factor. RCC beams - Single and doubly reinforced beams, T and L beams, continuous beams, lintels and brackets. RCC slabs – One way and two-way slabs.

MODULE - III

Construction Of Foundation of Special Structures

Erection of lattice towers, rigging and foundation of transmission line structures – construction sequence in cooling towers, silos, chimney, sky scrapers, bow string bridges, cable stayed bridges – Advanced construction techniques for offshore structures – construction sequence and methods in domes and priestess domes – foundation structure for heavy equipment and conveyor and machinery in heavy industries, foundation for transformers, lift foundation and foundation for steel frames and steel structures Advanced concepts: Flat slab, coffered slab, diaphragms, retaining walls and water tanks. Miscellaneous: RCC staircases and ramp – Waist slab and folded plate stair cases. RCC Balconies, chajjas etc.

MODULE – IV

Failures:
Introduction to building failures: causes of decay and damage in old buildings, issues of maintenance and repair. Preliminary inspection and general observation, decayed elements difference between decay and damage. Types ofStructural Distress and Deterioration, Factors Causing distress.

Sub Structure Construction

Box jacking pipe jacking – under pinning, trenchless technology, innovative road Construction techniques; immerse tube tunneling. Smart tunnels: application and construction.

MODULE – V

R.C. Concrete:

Mixing methods at site, structural design for repairs, construction stage defects-internal settlement of concrete, setting shrinkage of concrete, post-construction stage defects- temperature stresses, corrosionof reinforcement bars, weathering action, causes of failure in concrete structures for the given topics, pressure-grouting.

MODULE - VI

Methodical approach to Repairs:

Cracks over openings, sinking and sagging balconies, repairs to decayed floors and floor joints, example:Jack arch., madras roof terrace, foundation sinking, repairs to walls. Propping, strutting

Unusual problems:
Bulging in walls due to inadequate restrain, tensile cracking in brick walls, Repairs to large span rooms, water proofing the roof terraces, leakages from toilets, case studies and site visits.

Text books:

1. Advanced Construction Techniques by Jerry Irvine, CA Rocketr, 1984.

2. Barry, R The construction of buildings vol.2 5th ed. East-West press.New Delhi, 1999

Reference Books:

3. Hailey and Hancock, D.W. Brick work and associated studies vol.2. Macmillan London,1979.

4. The technology of building defects John Hinks, Geoff cook, 1997.

BT21B4C2 REFRIGERATION SYSTEMS

SEMESTER	Course Code	Course Title	L	T	P/S/F	C	Int. Marks	Ext. Marks	Total Marks
IV	BT21B4C2	Refrigeration Systems	4	-	-	4	50	50	100

COs	Course Outcomes	POs	BTLs
	The student will be able		
CO1	Illustrate the principles, nomenclature and applications of refrigeration Systems.	6,7	1,,2
CO2	Understand and analysis of various refrigeration cycles and components	6,7	1,2
CO3	Identify suitable refrigerant for various refrigerating systems and Environmental concerns	6,7	1,2
CO4	To learn about air conditioning systems and load calculations.	3,4	1,3
CO5	Different air conditioning systems are studied and selected.	6,7	1,2
CO6	Study the various control components in Refrigeration and low temperature applications	6,7	1,3

MODULE – I

Introduction: Basic Definitions, introduction of Refrigeration and Heat Pump: Carnot cycle, modification inreversed Carnot cycle, vapor compression cycle, actual vapor compression cycle. Application of air conditional and refrigeration energy usage in air-conditioning/ buildings.

Basic Refrigeration and Advanced Cycle: Single and multi- compressor and multi-evaporator system with flash chamber and intercooler, PH and TS diagram, thermodynamics analysis, effect of inter cooling and super heating, cascade refrigeration.

MODULE – II

Components of Vapour Compression Systems: Types of compressors, condensers, evaporators expansion devices (Classifications Only) –Comparison between air-cooled and water-cooled condense based air- conditioning plants.

Other refrigeration system: vapor absorption, vapor adsorption system, reversed Brayton cycle- air based refrigeration. Etc..,

MODULE – III

Refrigerants and Environmental Issues: Classification, nomenclature, desirable properties, secondary refrigerants, future industrial refrigerants.

Ozone depletion (ODP) and Global warming (GW), Montreal and Kyoto protocols, total equivalent warming index (TEWI), Azeotropic and zeotropic mixtures, alternative to existing CFC and HCFC refrigerants

MODULE – IV

Air-conditioning: Introduction to thermal comfort and parameters of indoor environment quality psychometrics properties, psychometric chart; Basic process in air-conditioning; Humidification and dehumidification process; introduction to evaporative cooling towers- Thermodynamic analysis.

Heating and cooling load Estimate: Components of cooling/'heat load, room sensible heat factor (RSHF), Grand sensible heat factor (GSHF), heating and load estimation of atypical office/ domestic building, concept of diversity.

MODULE – V

Types of Air conditioning system and selection criteria: Major system types in air-conditioning: unitary, package, central chilled water-based system: components of chilled water system, concept of primary- secondary chilled water pumping; concept of variable flow system, components of non-chilled water-based system, types and role for energy efficiency, comparison of variable refrigerant flow and constant flow systems.

MODULE – VI

Controls in RAC system: Introduction of building management system, major components and use of BMS; instrumentation requirements, concepts of direct digital control.

Low temperature application: Importance of cold chain, equipment types, introduction to design approach and equipment sizing, concept of cryogenics.

Miscellaneous topics: Installation, commissioning, noise, vibration electrical connection and safety in RAC system.

Text books:

1. Refrigeration & Air Conditioning, by C.P. Arora: Tata McGraw-Hill Education,2000.
2. Hand Book of Air Conditioning System Design / Carrier
3. Refrigeration& Air Conditioning by S.C. Jain: Chand and Co.
4. Refrigeration & Air Conditioning, by R C Arora: PHI 2012.

Reference Books:

1. Refrigeration and air conditioning by a. r. trot, t c welch.
2. Refrigeration & Air Conditioning, by Arora & Domkundwar: Dhanpat Rai & Co.

BT21B4C3 ELECTRICAL SYSTEMS

SEMESTER	Course Code	Course Title	L	T	P/S /F	C	Int. Marks	Ext. Marks	Total Marks
IV	BT21B4C3	Electrical Systems	4	-	-	4	50	50	100

COs	Course Outcomes	POs	BTLs
	The student will be able		
CO1	To Understand the basic knowledge of fundamental principle of Electricity.To Understand the basic knowledge of transmission, Distribution andUtilization of electricity.	1,2	1,2,3,4
CO2	To acquire the knowledge about substation design, installation and typeof substation	1,2	1,2,3,4
CO3	To Understand the electrical wiring and lighting load calculation.	1,2	1,2,3,4
CO4	To Understand the electrical protection types and safety aspects invarious building.	1,2	1,2,3,4
CO5	To Understand the electrical load estimation and power distributionsystem.	1,2	1,2,3,4
CO6	To understand all the specialized knowledge concerning	1,2	1,2,3,4

MODULE – I

Fundamental principles of Electricity:

Electricity - Definition, Units, & Symbols, Basics & Importance of Electricity, Electrical codes and standards, Indian Electricity Acts, Generation, Transmission and distribution system, Introduction to electric motor, drives, starters, UPS etc.

Utilization of Electricity, Electrical Switchgear (High Voltage and Low Voltage), Distribution Transformers:

Types of transmission and Distribution lines and their application, Types of transformer, on load Tap changers forTransformers, Power Factor Correction Capacitors. Generation of Electric Power, Standby DG Sets and their hookup
to the Mains Distribution, Multiple DG Sets Synchronization.

MODULE – II

Substation layouts:

SUBSTATIONS: Location of Substations: Rating of distribution substations, service area within primary feeders. Benefits derived through optimal location of substations. Classification of substations: Air insulated substations - Indoor & Outdoor substations: Substation layout showing the location of all the substation equipment. Bus bar arrangements in Sub-Stations: Simple arrangements like single bus bar, sectionalized single bus bar, main and transfer bus bar, Double breaker – One and half breaker system with relevant diagrams, lightening arrestors, Substation grounding.

MODULE – III

Electric layouts:

Conversion of 3-Phase to 1- Phase connection, preparation of layouts for residences, offices etc., Domestic appliances: Types of electric motors and electro mechanical devices. Construction and working of at least six domestic appliances and location in buildings.

MODULE – IV

Lighting Calculation:

NBC standards, nominal illumination levels in building interiors, lux, lumen, intensity, lighting schemes.

Building Wiring and Cable System

Wiring Rules and regulations. Types of Conductors, wiring methods and types of cables, Applications and Selection of wires and cables for general building. Applications and Selection of switches and sockets, boards service wires, metering distribution circuits, Lighting, and Power circuit wiring diagrams. Conduit Layout Design, Load schedule and Load balancing.

MODULE – V

Safety aspects in Electrical Systems:

Types of Firefighting systems for Electrical Equipment- Fuses, MCB's, MCCB's and C.B's and theirs cut outs, Standard heights of mounting accessories. Lightning Protection, Grounding - system grounding and equipment grounding, Earthing Methods, and Standards, ELCB, pipe earthing, plate earthing, Factors that affect the Earth Resistance, Earth Resistivity Measurements, and Earth fault detection and sensing.

MODULE – VI

Electrical load for small buildings and high rise building:

Definition of lighting load and power load, Lamps and Lamp circuits: Types of lamps - constructionof different types of lamps for small building, lamp circuit incorporating energy meter, cut out and distribution box. Electrical design for small scale building.

Lighting load, power load, wiring layout for large building, Design of size of - transformer, pump installation, cable size, and DG set Load sharing, Optimization of DG Set operation with respect to load. Electrical design for large scale building.

Text books

1. Electrical Wiring, Estimating & costing by S.L.Uppal Electrical wiring,

2. Estimating & costing by J.B.Gupta

3. Electrical Drawing by Balbir Singh Electrical wiring by Arora

4. Maintenance and Operation of Electrical Equipment by BVS Rao, VoI- I

5. Testing, Commissioning Operation & Maintenance of Electrical equipment by S.Rao

Reference Books:

6. Electrical Installation Estimation and Costing by M.Rajalingam.

7. Sally Hunt, "Making Competition Work in Electricity", 2002, John Wiley Inc.

BT21B4C4 CLIMATOLOGY AND BUILT ENVIRONMENT

SEMESTER	Course Code	Course Title	L	T	P/S /F	C	Int. Marks	Ext. Marks	Total Marks
IV	BT21B4C4	Climatology and Build Environment	2	2	-	3	50	50	100

COs	Course Outcomes	POs	BTLs
	The student will be able		
CO1	To understand the concept of climate factors and elements related to climate, Graphic representation of climate data, Mahoney's tables	1,4	2,4
CO2	To understand the concept related to natural ventilation along with all theapplication cum design oriented concept like supply air, heat discharge,dimensioning of the openings etc.,	1,3	2,3,4
CO3	To understand the concept of thermal comfort, concept of solar geometryand design of shading systems	1,3	2,3
CO4	To understand the basic knowledge on heat transfer and its modes	1,3	2,4
CO5	To understand the concept of heat flow through buildings, glazing materialsand the u values.	1,3	2,3
CO6	To understand the concept of passive cooling, climatologically performance ofconcept of the building.	1,3	2,3

MODULE – I

Climate concepts

Climate and built form interaction. Global climatic factors, elements of climate, micro and macro climate, classification of tropical climates, different zones, design consideration for warm humid, hot dry, composite and upland climate wind conditions & external noise, challenge of rapid extreme environmental change. Graphic representation of climatic data, Mahoney's tables.

MODULE – II

Natural Ventilation

Air movement around & through buildings, orientation for wind and stack effect, air hygiene, fresh air supply and heat discharge, ventilation rates and air speeds, dimensioning ventilation openings, concepts for control and regulation in atria, glass halls, high-rise buildings, double-shell facades, roofed sports arenas and industrial manufactories.

MODULE – III

Thermal Comfort

Thermal comfort factors, physiological aspects, body heat balance, comfort range, comfort charts.

Sun and the design process

Solar geometry, solar charts, sun angles and shadow angles, Orientation for sun, sun control. Design of

shading system (external/internal, screen/blinds, coloring, etc.) Intensity of window ventilation rate (type,height, width, position and number of opening vents, etc.)
MODULE – IV
Basics of Heat Transfer and its modes: Introduction-Conduction-Convection-Radiation-different heat transfer co-efficient-equations for heat transfer-overall heat transfer co-efficient-critical radius of insulation(basic concept without
MODULE – V
Heat flow through buildings. Basic principles of heat transfer through buildings, size, position and number of windows (proportion of window area), type of glazing (heat insulating glazing or sun protection glazing), Thermal load calculations, static load,dynamic load, insulation properties, U values for materials.
MODULE – VI
Passive cooling Passive methods of cooling, roof pond, desiccant cooling, evaporative cooling earth sheltered buildings, site planning (including landscape) and building design consideration to climatic factors. Detailed appraisal/analysis climatologically performance of an existing residence and or aworkplace; followed by the redesigning or same to improve the climatologically performance.

Text books:

1. Manual of Tropical Climate and Housing and Building, by Koenigsberger, O.H. and others:Orient Longman, Chennai-2003
2. Tropical Architecture, by Kukreja, C.P: Tata McGraw-Hill pub.co.Ltd., New Delhi-1978.
3. Chartered Institution of Building Services Engineers (CIBSE), AM10 Natural Ventilation inNon-Domestic Buildings, 2005.
4. Sun, Wind & Light: Architectural Design Strategies (3rd edition), by G. Z. Brown andMarkDeKay: John Wiley & Sons, 2014.

Reference Books:

5. Architecture of the well-tempered environment (2nd edition), by Roger Benham: TheUniversity of Chicago Press, Chicago, 1984.
6. Heating, Cooling, Lighting: Design Methods for Architects (2nd edition), by Norbert Lechner:JohnWiley& Sons2001.
7. Building Performance Simulation for Design and Operation, byJ L M Hensen and RLamberts(Editors):Taylor & Francis, 2011 K Voss.

MC21B401 ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE

SEMESTER	Course Code	Course Title	L	T	P/S/F	C	Int. Marks	Ext. Marks	Total Marks
IV	MC21B401	Essence of Indian Traditional Knowledge	1	0	0	0	-	-	-

COs	Course Outcomes	POs	BTLs
	The student will be able		
CO1	To Identify the concept of Traditional knowledge and its importance.	6,7	1,2
CO2	To Explain the need and importance of protecting traditional knowledge.	6,7	1,2
CO3	To Illustrate the various enactments related to the protection of traditional Knowledge.	6,7	1,2
CO4	To Interpret the concepts of Intellectual property to protect the traditional Knowledge.	6,7	1,2
CO5	To Explain the importance of Traditional knowledge in Agriculture and Medicine.	6,7	1,2
CO6	To understand the importance of Indian ancient education system and benefits	6,7	1,2

MODULE – I

Introduction to traditional knowledge: Define traditional knowledge, nature and characteristics, scope and importance, kinds of traditional knowledge, Indigenous Knowledge (IK), characteristics, traditional knowledge vs indigenous knowledge, traditional knowledge vs western knowledge traditional knowledge

MODULE – II

Legal framework and TK: The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006, Plant Varieties Protection and Farmer's Rights Act, 2001 (PPVFR Act); The Biological Diversity Act 2002 and Rules 2004, the protection of traditional knowledge bill, 2016.

MODULE – III

Protection of traditional knowledge: The need for protecting traditional knowledge Significance of TK Protection, value of TK in global economy, Role of Government to harness TK.

MODULE – IV

Traditional knowledge and intellectual property: Systems of traditional knowledge protection, Legal concepts for the protection of traditional knowledge, Patents and traditional knowledge, Strategies to Increase protection of traditional knowledge.

MODULE – V

Traditional Knowledge in Different Sectors: Traditional knowledge and engineering, Traditional medicine system, TK in agriculture, Traditional societies depend on it for their food and healthcare needs,Importance of conservation and sustainable development of environment, Management of biodiversity, Food security of the country and protection of TK

MODULE – VI

Education System in India: Education in ancient, medieval and modern India, aims of education, subjects, languages, Science and Scientists of Ancient India, Science and Scientists of Medieval India, Scientists of Modern India.

Text books:

1. Traditional Knowledge System in India, by Amit Jha, 2009.
2. Narain, "Examinations in ancient India", Arya Book Depot, 1993
3. Satya Prakash, "Founders of Sciences in Ancient India", Vijay Kumar Publisher, 1989
4. M. Hiriyanna, "Essentials of Indian Philosophy", Motilal Banarsidass Publishers, ISBN 13: 978-8120810990, 2014

Reference Books:

1. "Knowledge Traditions and Practices of India" Kapil Kapoor1, Michel Danino2.
2. "Science in Samskrit", Samskrita Bharti Publisher, ISBN 13: 978-8187276333, 2007
3. Kapil Kapoor, "Text and Interpretation: The India Tradition", ISBN: 81246033375, 2005
4. "Science in Samskrit", Samskrita Bharti Publisher, ISBN 13: 978-8187276333, 2007
5. NCERT, "Position paper on Arts, Music, Dance and Theatre", ISBN 81-7450 494-X, 200
6. Narain, "Examinations in ancient India", Arya Book Depot, 1993
7. Satya Prakash, "Founders of Sciences in Ancient India", Vijay Kumar Publisher, 1989
8. M. Hiriyanna, "Essentials of Indian Philosophy", Motilal Banarsidass Publishers, ISBN 13: 978-8120810990, 2014.

BT21B4O1 SOLAR POWER SYSTEM

SEMESTER	Course Code	Course Title	L	T	P/S/F	C	Int. Marks	Ext. Marks	Total Marks
IV	BT21B4O1	Solar Power System	-2	0	0	2	100	-	100

COs	Course Outcomes	POs	BTLs
	The student will be able		
CO1	Acquire knowledge on solar radiation principles with respect to solar energy estimation..	1,2,4	2,3
CO2	Get familiarized with various collecting techniques of solar energy and its storage	1,2,4	2,3
CO3	Learn the solar photovoltaic technology principles and different types of solar cells for energy conversion and different photovoltaic applications.	1,2,4	2,3

MODULE – I

Solar Radiation: Sun as a source of energy, Solar radiation, Solar radiation at the Earth's surface, Measurement of Solar radiation-Pyroheliometer, Pyranometer, Sunshine recorder, Prediction of available solar radiation, Solar energy-Importance, Storage of solar energy, Solar pond.

MODULE – II

Solar Thermal Systems: Principle of conversion of solar radiation into heat, Collectors used for solar thermal conversion: Flat plate collectors and Concentrating collectors, Solar Thermal Power Plant, Solar cookers, Solar hot water systems, Solar dryers, Solar Distillation, Solar greenhouses.

MODULE – III

Solar Photovoltaic Systems: Conversion of Solar energy into Electricity - Photovoltaic Effect, Solar photovoltaic cell and its working principle, Different types of Solar cells, Series and parallel connections, Photovoltaic applications: Battery chargers, domestic lighting, street lighting and water pumping

Reference Books:

1. Solar Energy Utilization, G. D. Rai, Khanna Publishers 1. Solar Energy- Fundamentals, design, modeling & applications, G.N. Tiwari, Narosa Pub., 2005.
2. Solar Energy-Principles of thermal energy collection & storage, S.P. Sukhatme, Tata McGraw Hill Publishers, 1999.
3. Solar Photovoltaics- Fundamentals, technologies and applications, Chetan Singh Solanki, PHI Learning Pvt. Ltd.,
4. Science and Technology of Photovoltaics, P. Jayarama Reddy, BS Publications, 2004.

SEMESTER-V

BT21B5S1 BUILDING SERVICES STUDIO-V

SEMESTER	Course Code	Course Title	L	T	P/S /F	C	Int. Marks	Ext. Marks	Total Marks
V	BT21B5S1	Building Services Studio-V	2	-	6	7	100	100	200

COs	Course Outcomes	POs	BTLs
	The student will be able		
CO1	Acquainting with the various ways of designing a plumbing system in building in urban context i.e. low/medium rise, high density, high rise etc	1,2,3	**2,4,5**

MODULE – I

Study and Analysis- Through literature studies and case studies analyze the constraints, typologiesand interventions in Lighting and power system.

Design Proposal- Design of a building project incorporating varied formats of grouping on anactual site with specific bye-laws and regulations, calculating – demand of Lighting and power load.

ELECTRICAL DESIGN CALCULATIONS

- Lighting load calculation: The average illuminance (lumen, zonal cavity), point-to-point, flux transfer.
- Design of Transformer size and DG set size.
- LT Panel Board Design: MDB, SMDB, DB
- Load schedule & Load balancing: R, Y, B phase balancing.
- Standard heights of mounting accessories.
- Electrical wiring system: Lighting, power circuit wiring diagrams.
- Calculating the Total power requirements
- Types & selection of Circuit Breakers, fuses and cables
- Estimation of the quantities of electrical services.

EARTHING & LIGTINING PROTECTION SYSTEM

- Earthing Systems (Types Method and Installation)
- Earth pit calculation and strip calculation
- Lightning Protection Systems

ELECTRICAL SYSTEM DESIGN

- **Site Level**: Transformer, DG set, Panel board, Server (UPS) and Communication & Earthing Layout
- **Building Level**: Conduit Layout, MDB, SMDB, DB, Switch Board and Protective Devices (MCB, MCCB), Preparation of general installations and sections.
- **Individual Level**: Electrical Loads (Power Load & Lighting Load)

Preparation of conduit, power, lighting and cable tray layout at site level and building level, report containing calculations and specifications, catalogue reference for a gated community, resorts, hotels, hospitals, manufacturing unit, complex or office building.

Expected Outcome& Assignments:

Major design problem: Literature review, Data collection, Case study and proposal for a hospital,

manufacturing unit, resorts and hotels. Any two minor design problems like commercial complex or office building. In the form of reports and drawings.

Text Books:

1. Electrical Wiring, Estimating and Costing E-Book by S.L. Uppal & G.C. Garg
2. Electrical Design Estimating and Costing 1st addition by new age international (p) limited.Publishers-2004 By K.B.Raina & S.K.Bhattacharya
3. Electrical Installation Estimating and Costing JB Guptha VIII Edition S.K. Katria and Sons
4. Surjit Singh by of Electrical estimating & costing 2nd addition By Khanna Publishers-1997.NBC 2005
5. Building Services hand book by Fred Hall and Roger Greeno. Ninth Edition

Reference Books:

1. Design of Electrical Services for Buildings by Barrie Rigby fourth edition.
2. Electrical design for building construction, by John E. Traister McGraw-Hill Book Company,1985 - Technology & Engineering Building Services Engineering By DavidV.Chadderton.

BT21B5C4 BUILDING INFORMATION MODELING

SEMESTER	Course Code	Course Title	L	T	P/S/F	C	Int. Marks	Ext. Marks	Total Marks
V	BT21B5P1	Building Information Modeling	2	-	2	3	50	50	100

COs	Course Outcomes	POs	BTLs
	The student will be able		
CO1	To revise the concept on Revit applied to architecture including the basics of BIM	1,5,9	2,3
CO2	To draw a basic floor plan including walls and other basic elements of a building	1,5,9	2,3,6
CO3	To work with elevations and sections, 3D views and work with the dimensions and constraints	1,2,5, 9	2,3,6
CO4	To develop the building model including some complex elements of the building, working with creating, detailing and drafting the views	1,2,5, 9	2,3,6
CO5	To create and modify the schedules, create legends and keynotes, presentingand printing the building model and other features	1,2,5, 9	2,3,6
CO6	To create renderings, Using Walk through, Sun and Shadow Settings.	1,2,59	2,3,6

MODULE – I

Building Information Modeling, background and history, need for BIM. Revit Architecture Basics, Exploring the User Interface, working with Revit on Elements and Families, Starting a Project.

MODULE - II

Starting a Design, creating a Basic Floor Plan, Creating and Modifying Levels, working with Grids, The Basics of the Building Model, Adding and Modifying Walls, Working with Compound and Vertically Compound Walls, Using Editing commands, Working with Doors, Adding and Modifying Windows, Loading Additional Building Components, Adding and Modifying Component Families.

MODULE - III

Viewing the Building Model, Managing Views, Controlling Object Visibility, Working with Sectionand Elevation views, Creating and Modifying 3D Views.
Using Dimensions and constraints, working with Dimensions, Applying and Removing Constraints.

MODULE - IV

Developing the Building Model, Creating and Modifying Floors, Adding and Modifying Ceilings, Adding and Modifying Roofs, creating curtain walls, Adding Stairs and Railings.
Detailing and Drafting, Creating Callout views, working with Text and Tags, Working with Detail Views, Working with Drafting Views.

MODULE - V

Construction Documentation, Creating and Modifying Schedules, Creating Rooms and Room Schedules,Creating Legends and Keynotes.
Presenting the Building Model, Creating and Printing Drawing Sheets, Working with Title Blocks,

Managing Revisions.
MODULE-VI
Creating Renderings, Using Walk through, Using Sun and Shadow Settings.

Text books:

1. BIM Handbook; A guide to building information modeling for owners Managers,Designers, Engineers and contractors, by Charles M. Eastman,Kathleen Liston, Paul Teicholz, and Rafael Sacks., Wiley2008
2. Building Information Modelling- A strategic implementation Guide by DanaK.Smith & Michael Tardif, published by John Wiley & Sons

Reference Books:

1. Building Information Modeling by Willem Kymmell., McGraw-Hill Education. 2008.

BIM and Construction Management by Brad Hardin & Dave Mccool, 2nd Edition, Wiley Publication.

BT21B5K1 SKILL ENHANCEMENT COURSE-3

SEMESTER	Course Code	Course Title	L	T	P/S/F	C	Int. Marks	Ext. Marks	Total Marks
V	BT21B5K1	Artificial Intelligence & Machine Learning	2	-	-	2	100	-	100

COs	Course Outcomes	POs	BTLs
	The student will be able		
CO1	To understand the basic concepts of Artificial intelligence and search strategies	1,5	1,3
CO2	To understand the advanced search	2,4	4
CO3	To understand the Learning and expert systems	4	4,5
CO4	To understand Constraint Satisfaction Problems and natural language processing	2,3	2
CO5	To understand the Learning and expert systems	2,4	2
CO6	To understand the reasoning under uncertainty	2,5	2,3

MODULE – I

Introduction: AI problems, Agents and Environments, Structure of Agents, Problem Solving Agents

Basic Search Strategies: Problem Spaces, Uninformed Search (Breadth-First, Depth-First Search, Depth-first with Iterative Deepening), Heuristic Search (Hill Climbing, Generic Best-First, A*), Constraint Satisfaction (Backtracking, Local Search)

MODULE - II

Advanced Search: Constructing Search Trees, Stochastic Search, A* Search Implementation, Minimax Search, Alpha-Beta Pruning.

MODULE - III

Basic Knowledge Representation and Reasoning: Propositional Logic, First-Order Logic, Forward Chaining and Backward Chaining, Introduction to Probabilistic Reasoning, Bayes Theorem Advanced Knowledge **Representation and Reasoning**: Knowledge Representation Issues, Non monotonic Reasoning, Other Knowledge Representation Schemes

MODULE - IV

Reasoning Under Uncertainty: Basic probability, Acting Under Uncertainty, Bayes' Rule, Representing Knowledge in an Uncertain Domain, Bayesian Networks

MODULE - V

Well-posed learning problems, designing a learning system, Perspectives and issues in machine learning Concept learning and the general to specific ordering – introduction, a concept learning task, concept learning as search, find-S: finding a maximally specific hypothesis.

MODULE - VI
Decision Tree Learning –Introduction, decision tree representation, appropriate problems for decision tree learning, the basic decision tree learning algorithm, hypothesis space search in decision. tree learning, inductive bias in decision tree learning, issues in decision tree learning.

Textbooks:

1. Russell, S. and Norvig, P, Artificial Intelligence: A Modern Approach, Third Edition, Prentice Hall, 2010.

2. Artificial Intelligence Building Intelligent Systems- ParagKulkarni, Prachi Joshi.

Reference Books.

1. Artificial Intelligence, Elaine Rich, Kevin Knight, Shivashankar B. Nair, The McGraw Hill publications, Third Edition, 2009.

2. George F. Luger, Artificial Intelligence: Structures and Strategies for Complex Problem Solving, Pearson Education, 6th ed., 2009.

GN21B5CSP COMMUNITY SERVICE PROJECT

SEMESTER	Course Code	Course Title	L	T	P/S/F	C	Int. Marks	Ext. Marks	Total Marks
V	GN21B5CSP	Community Service Project	(During Vacation) 180 hours						

COs	Course Outcomes	POs	BTLs
	The student will be able		
CO1	Involve in community development and service activities and applies the experience to personal and academic development.		

MODULE – I

Introduction:

- Community Service Project is an experiential learning strategy that integrates meaningful community service with instruction, participation, learning and community development.
- Community Service Project involves students in community development and service activities and applies the experience to personal and academic development.
- Community Service Project is meant to link the community with the college for mutual benefit. The community will be benefited with the focused contribution of the college students for the village/ local development. The college finds an opportunity to develop social sensibility and responsibility among students and also emerge as a socially responsible institution.

Objective:

Community Service Project should be an integral part of the curriculum, as an alternative to the 2 months of Summer Internships / Apprenticeships / On the Job Training, whenever there is an exigency when students cannot pursue their summer internships.

The specific objectives are;

- To sensitize the students to the living conditions of the people who are around them,
- To help students to realize the stark realities of the society.
- To bring about an attitudinal change in the students and help them to develop societal consciousness, sensibility, responsibility and accountability.
- To make students aware of their inner strength and help them to find new /out of box solutions to the social problems.
- To make students socially responsible citizens who are sensitive to the needs of the disadvantaged sections.

- To help students to initiate developmental activities in the community in coordination with public and government authorities.

- To develop a holistic life perspective among the students by making them study culture, traditions, habits, lifestyles, resource utilization, wastages and its management, social problems, public administration system and the roles and responsibilities of different persons across different social systems.

Implementation of Community Service Project:

- Every student should put in a 6 weeks for the Community Service Project during the summer vacation.

- Each class/section should be assigned with a mentor.

- Specific Departments could concentrate on their major areas of concern.

- A log book has to be maintained by each of the student, where the activities undertaken/involved to be recorded.

- The logbook has to be countersigned by the concerned mentor/faculty incharge.

- Evaluation to be done based on the active participation of the student and grade could be awarded by the mentor/faculty member.

- The final evaluation to be reflected in the grade memo of the student.

- The Community Service Project should be different from the regular programmes of NSS/NCC/Green

Corps/Red Ribbon Club, etc.

- Minor project report should be submitted by each student. An internal Viva shall also be conducted by a committee constituted by the principal of the college.

- Award of marks shall be made as per the guidelines of Internship/apprentice/ on the job training.

Procedure

- A group of students or even a single student could be assigned for a particular habitation or village or municipal ward, as far as possible, in the near vicinity of their place of stay, so as to enable them to commute from their residence and return back by evening or so.

- The Community Service Project is a twofold one –

    - First, the student/s could conduct a survey of the habitation, if necessary, in terms of their own domain or subject area. Or it can even be a general survey, incorporating all the different areas. A common survey format could be designed. This should not be viewed as a duplication of work by the Village or Ward volunteers, rather, it could be another primary source of data.
    - Secondly, the student/s could take up a social activity, concerning their domain or subject area.

- The different areas, could be like –

Agriculture	Law & Order
♣ Health	♣ Excise and Prohibition
♣ Marketing and Cooperation	♣ Mines and Geology
♣ Animal Husbandry	♣ Energy
♣ Horticulture	♣ Internet
♣ Fisheries	♣ Free Electricity
♣ Sericulture	♣ Drinking Water
♣ Revenue and Survey	♣ Irrigation
♣ Natural Disaster Management	

EXPECTED OUTCOMES

BENEFITS OF COMMUNITY SERVICE PROJECT TO STUDENTS

Learning Outcomes

- Positive impact on students' academic learning
- Improves students' ability to apply what they have learned in "the real world"
- Positive impact on academic outcomes such as demonstrated complexity of understanding, problem analysis, problem-solving, critical thinking, and cognitive development
- Improved ability to understand complexity and ambiguity.

Personal Outcomes

- Greater sense of personal efficacy, personal identity, spiritual growth, and moral development
- Greater interpersonal development, particularly the ability to work well with others, and build leadership and communication skills.

Social Outcomes

- Reduced stereotypes and greater inter-cultural understanding.
- Improved social responsibility and citizenship skills.
- Greater involvement in community service after graduation.

Career Development

- Connections with professionals and community members for learning and career opportunities.

- Greater academic learning, leadership skills, and personal efficacy can lead to greater opportunity.

Relationship with the Institution

- Stronger relationships with faculty.
- Greater satisfaction with college.
- Improved graduation rates.

BENEFITS OF COMMUNITY SERVICE PROJECT TO FACULTY MEMBERS

- Satisfaction with the quality of student learning.
- New avenues for research and publication via new relationships between faculty and community.
- Providing networking opportunities with engaged faculty in other disciplines or institutions.
- A stronger commitment to one's research.

BENEFITS OF COMMUNITY SERVICE PROJECT TO COLLEGES AND UNIVERSITIES

- Improved institutional commitment.
- Improved student retention.
- Enhanced community relations.

BENEFITS OF COMMUNITY SERVICE PROJECT TO COMMUNITY

- Satisfaction with student participation.
- Valuable human resources needed to achieve community goals.
- New energy, enthusiasm and perspectives applied to community work.
- Enhanced community-university relations.

SUGGESTIVE LIST OF PROGRAMMES UNDER COMMUNITY SERVICE PROJECT

The following the recommended list of projects for Engineering students. The lists are not exhaustive and open for additions, deletions and modifications. Colleges are expected to focus on specific local issues for this kind of projects. The students are expected to carry out these projects with involvement, commitment, responsibility and accountability. The mentors of a group of students should take the responsibility of motivating, facilitating, and guiding the students. They have to interact with local leadership and people and appraise the objectives and benefits of this kind of projects. The project reports shall be placed in the college website for reference. Systematic, Factual, methodical and honest reporting shall be ensured.

For Engineering Students

1. Water facilities and drinking water availability	21. Plant diseases
2. Health and hygiene	22. Yoga awareness and practice
3. Stress levels and coping mechanisms	23. Health care awareness programmes and their impact
4. Health intervention programmes	24. Use of chemicals on fruits and vegetables
5. Horticulture	25. Organic farming
6. Herbal plants	26. Crop rotation
7. Botanical survey	27. Floury culture
8. Zoological survey	28. Access to safe drinking water
9. Marine products	29. Geographical survey
10. Aqua culture	30. Geological survey
11. Inland fisheries	31. Sericulture
12. Animals and species	32. Study of species
13. Nutrition	33. Food adulteration
14. Traditional health care methods	34. Incidence of Diabetes and other chronic diseases
15. Food habits	35. Human genetics
16. Air pollution	36. Blood groups and blood levels
17. Water pollution	37. Internet Usage in Villages
18. Plantation	38. Android Phone usage by different people
19. Soil protection	39. Utilisation of free electricity to farmers and related issues
20. Renewable energy	40. Gender ration in schooling level- observation.

Complementing the community service project the students may be involved to take up some awareness campaigns on social issues/special groups. The suggested list of programmes are:

Programmes for School Children

1. Reading Skill Programme (Reading Competition)

2. Preparation of Study Materials for the next class.

3. Personality / Leadership Development

4. Career Guidance for X class students

5. Screening Documentary and other educational films

6. Awareness Programme on Good Touch and Bad Touch (Sexual abuse)

7. Awareness Programme on Socially relevant themes.

Programmes for Women Empowerment

1. Government Guidelines and Policy Guidelines

2. Womens' Rights

3. Domestic Violence

4. Prevention and Control of Cancer

5. Promotion of Social Entrepreneurship

General Camps

1. General Medical camps

2. Eye Camps

3. Dental Camps

4. Importance of protected drinking water

5. ODF awareness camp

6. Swatch Bharath

7. AIDS awareness camp

8. Anti Plastic Awareness

9. Programmes on Environment

10. Health and Hygiene

11. Hand wash programmes

12. Commemoration and Celebration of important days.

Programmes for Youth Empowerment

1. Leadership

2. Anti-alcoholism and Drug addiction

3. Anti-tobacco

4. Awareness on Competitive Examinations

5. Personality Development

Common Programmes

1. Awareness on RTI

2. Health intervention programmes

3. Yoga

4. Tree plantation

5. Programmes in consonance with the Govt. Departments

Role of Students:

- Students may not have the expertise to conduct all the programmes on their own. The students then can play a facilitator role.

- For conducting special camps like Health related, they will be coordinating with the Governmental agencies.

- As and when required the College faculty themselves act as Resource Persons.

- Students can work in close association with Non-Governmental Organizations like Lions Club, Rotary Club, etc or with any NGO actively working in that habitation.

- And also with the Governmental Departments. If the programme is rolled out, the District Administration could be roped in for the successful deployment of the programme.

- An in-house training and induction programme could be arranged for the faculty and participating students, to expose them to the methodology of Service Learning.

TIMELINE FOR THE COMMUNITY SERVICE PROJECT ACTIVITY

Duration: 8 weeks

1. Preliminary Survey (One Week)

- A preliminary survey including the socio-economic conditions of the allotted habitation to be conducted.

- A survey form based on the type of habitation to be prepared before visiting the habitation with the help of social sciences faculty. (However, a template could be designed for different habitations, rural/urban.

- The Governmental agencies, like revenue administration, corporation and municipal authorities and village secreteriats could be aligned for the survey.

2. Community Awareness Campaigns (One Week)

- Based on the survey and the specific requirements of the habitation, different awareness campaigns and programmes to be conducted, spread over two weeks of time. The list of activities suggested could be taken into consideration.

3. Community Immersion Programme (Three Weeks)

Along with the Community Awareness Programmes, the student batch can also work with any one of the below listed governmental agencies and work in tandem with them. This community involvement programme will involve the students in exposing themselves to the experiential learning about the community and its dynamics. Programmes could be in consonance with the Govt. Departments.

4. Community Exit Report (One Week)

- During the last week of the Community Service Project, a detailed report of the outcome of the 8 weeks work to be drafted and a copy shall be submitted to the local administration. This report will be a basis for the next batch of students visiting that particular habitation. The same report submitted to the teacher-mentor will be evaluated by the mentor and suitable marks are awarded for onward submission to the University.
- Throughout the Community Service Project, a daily log-book need to be maintained by the students batch, which should be countersigned by the governmental agency representative and the teacher-mentor, who is required to periodically visit the students and guide them.

BT21B5C1 HVAC SYSTEMS

SEMESTER	Course Code	Course Title	L	T	P/S/F	C	Int. Marks	Ext. Marks	Total Marks
V	BT21B5C1	HVAC Systems	2	2	-	3	50	50	100

COs	Course Outcomes	POs	BTLs
	The student will be able		
CO1	To learn about the concept of heat transfer through building structures andbasic heat load calculations	1,2,3	2,3,5
CO2	To learn the concepts of different air conditioning systems and differentdevices of central air-conditioning systems	1	1,2
CO3	To learn the physics involved and the supply of chilled air in the system ofdistribution of Air in the central air-conditioning system	1,2,3	2,3,6
CO4	To understand the importance of fans and blowers along with physics behind the air supply and also the water supply system in more tonnage ofair conditioning systems as per ASHRAE standards	1,2,3,4	2,3,6
CO5	To understand the concept of piping systems for the flow of refrigerants andchilled water, pump selection for supply along with the performance studyand calculations of it etc.,	1,2,3	2,3
CO6	To understand the concepts of exhaust and ventilation systems, insulation and specifications of the equipments	1	2,3

MODULE – I

Building survey-

Location of equipment. Heat gain through glass-calculation of solar heat gain through ordinary glass tables-shading devices-effect of shading devices. Thermal resistance of various building materials.

Heat Transfer through Building Structures:

Periodic heat transfer through walls and roofs. Empirical methods to calculate heat transfer through wallsand roofs using decrement factor and time lag method. Equivalent temperature difference method.

Heating Load Calculations:

Winter heating load calculation-heat losses through structure-heat losses due to infiltration. Effects of solar radiation and internal heat sources on heating loads. Methods for estimating energy requirements forheating.

MODULE - II

Air Conditioning Systems:

All water, all air, air water system. Unitary System, window air conditioner, split and central air conditioning system, Non-Central AC, Package AC System, VRV/VRF System, Chilled Water System.

Equipments selection:

Selection of cooling tower, Selection of Chillers, AHU and FCU classification and selection, Package unit selection DX unit selection, Selection of De-humidifier.

MODULE - III

Air Distribution:

Types of Ducts, Duct fittings, Dampers, Flexible ducts, Classification of Duct(Low, Medium & High pressure), Duct gauge selection, Comparison between different shapes of duct, Duct Fabrication, Insulation & Installation procedure, Vanes location & number of vanes required, Type of Duct Materials, Calculation of total sheet required for Duct Fabrication& estimating duct weight in kg, Selection of Duct Gauges & thickness, Hanger Spacing, Hanger Rod Diameter and Angle support Size, Types of Air Terminal Device, Selection and Sizing of Air Terminal Device (Manually)

Duct Designing methods (Manual calculations):

Equal friction method, Velocity reduction method, Static regains method.

MODULE – IV

Air Conditioning Apparatus:

Fans and blowers - types of fans- fan characteristic centrifugal fans, axial fans -- fan arrangements, filters, sources of noise and control, static pressure calculation for selection of motor and fan. Water supply pipe sizing calculations - piping network for supply and return water line - pipe fittings - lining and insulation- piping system as per ASHRAE standards.

MODULE - V

Piping: Refrigerant Pipe sizing, Chilled water pipe sizing, Study on Chilled Water Systems, Types & Application of Chillers, AHU's, FCU's & FAHU's, Chilled Water Pipe Sizing by ASHRAE standards, Types of Valves & Its Connection, Valve Authority, Open loop & Closed loop system, Primary and Secondary pump system, Common Header Pipe Sizing, Hydraulic Calculation for Pump Selection, Expansion Tank Sizing, Air Separator, Pump Cavitations, Pump Curves , NPSH Calculation for Pumps, Advance Psychometric Analysis, Determine Mix Air Temperature, Calculate the Flow of Air, ESHF, Ton of Refrigeration, Design of CAV & VAV System

MODULE - VI

Exhaust Systems:

General exhaust systems. Local exhaust system, Removal of pollutants and contaminated air. Air cleaning devices, Fans.

Ventilation in Kitchen:

Characteristics of Smoke emitted from Cooking, Exhaust flow, IMC (International Mechanical Code) Types of hood, Design of hood. Design factors.

Thermal Insulation for A/C System:

Desired properties of ideal insulating materials - types of insulating materials. Heat transfer through insulation - economic thickness of insulation.

Specifications for equipment and installation

Painting and identification , electrical work and cabling (only basic information)

Text books:

1. Refrigeration & Air Conditioning, by C.P. Arora:3rd Edition, Tata McGrew Hill publication.
2. Refrigeration & Air Conditioning, by R.S. Khurmi, S.Chand Publications

Reference Books:

1. Refrigeration & Air Conditioning,by R C Arora Fourth Edition:PHI 2012.
2. Hand Book of Air Conditioning System Design / Carrier.
3. Refrigeration & Air Conditioning,byS.C.Jain: Chand and Co.Electrical and Mechanical Services in HighRise Building, by A.K Mittal: CBS Publisher

BT21B5C2 FIRE ENGINEERING AND SCIENCE

SEMESTER	Course Code	Course Title	L	T	P/S/F	C	Int. Marks	Ext. Marks	Total Marks
V	BT21B5C2	Fire Engineering and Science	2	-	2	3	50	50	100

COs	Course Outcomes	POs	BTLs
	The student will be able		
CO1	Understand the fundamentals of fire extinguishment and flash and fire point	3,5	2,3
CO2	To illustrate the Fire Detector and its uses and types fire Systems	3,5	2,3
CO3	To erect the firefighting apparatus	3,5	2,3
CO4	Understand the operation and deployment of firefighting equipment	3,5	2,3
CO5	To comprehend fire alarm systems and evaluate fire exit routes	3,5	2,3
CO6	Have a better understanding of advanced firefighting techniques and equipment	3,5	2,3

MODULE – I

Chemistry of Fire, Oxidation, Slow – rapid – spontaneous combustions, chain reaction, Flash point &Fire point ignition temperature, Classification of Fire, Methods of extinguishment, First aid firefighting arrangement Types of fire extinguishers.

MODULE - II

Basic science of water-based / gas / dry power fire systems; Pedestal fire hydrant system, sprinkler system,water spray/deluge system, drencher system, fixed foam system, dry pipe foam system; Halogen gas system, CO_2system and dry powder system; Computer programs for system design; Smoke control systems; Fire safety control in HVAC systems.

MODULE - III

Fixed Installation: External hydrant, Ring mains, Hose reels, wet and dry riser, Automatic sprinkler system Deluging system, Drencher system, Premixed foams solutions, and Flooding system.

MODULE - IV

Pumps and classification, Discharge and suction head, Pressure and power requirements, Starting and troubleshooting, Pump testing and relay operation. Water hammer, Parallel and series connections,Branching lines, local losses and Friction losses in pipe, Discharge pressure at sprinkler head and nozzles.

MODULE - V

Fire alarm systems: purpose, general requirements, basic components, types of detectors, hazards of smoke, heat, toxicity and flame. Their detection and monitoring, testing and monitoring of alarm systems. **Protection against fires**: Fire rating of building materials and components, Insulation and Coatings, Fire and smoking barriers, Fire Zones, door and window locking systems. Storage of flammable and hazardous materials, Fire risk Assessment

Fire Escape route: Exit signage, Fire evacuation plan and layouts, Fire drill.

MODULE - VI
Advance technologies in fire fighting system, water mist systems, fire escaping chutes, passive fire protection systems. Backpack and trolley fire extinguishers. Designing the fire fighting layouts – Schemes and schematics for Sprinkler systems, public address system.

Text books:

1. Fire Protection design manual, 6th edition by Department of Veterans Affairs.
2. National Building Code - NBC (Part-4).

Reference Books

3. Fire Safety, Science and Engineering: A Symposium (Astm Special Technical Publication)by
   T. Z. Harmathy.
4. Principles of Fire Safety Engineering – Understanding Fire and Fire Protection by AkhilKumar Das, Second Edition,PHI Publications

BT21B5C3 ILLUMINATION ENGINEERING

SEMESTER	Course Code	Course Title	L	T	P/S/F	C	Int. Marks	Ext. Marks	Total Marks
V	BT21B4C3	Illumination Engineering	2	-	2	3	50	50	100

COs	Course Outcomes	POs	BTLs
	The student will be able		
CO1	To grasp the generalized concept of lighting	1	2
CO2	To learn the measurement of lighting and its parameters	1,3	5
CO3	To learn how to design interior lighting and their evaluation	1,3	5
CO4	To learn how to design outdoor lighting concerning street lighting and theirevaluation	1,3	5
CO5	To learn how to design outdoor lighting concerning flood lighting and theirevaluation	1,3	5
CO6	To learn the Special Features of Aesthetic Lighting and energy conservation codes	1	2

MODULE – I

Introduction of Light : Types of illumination, Day lighting, Supplementary artificial lighting and total lighting, Quality of good lighting, Factors affecting the lighting-shadow, glare, reflection, Colour rendering and stroboscopic effect, Methods of artificial lighting, Lighting systems-direct, indirect, semi direct, semi indirect, Lighting scheme, General and localized

MODULE - II

Measurement of Light : Definition of luminous flux, Luminous intensity, Lumen, Candle power, Illumination, M.H.C.P, M.S.C.P, M.H.S.C.P, Lamp efficiency, Brightness or luminance, Laws of illumination, Inverse square law and Lambert's Cosine law, Illumination at horizontal and vertical plane from point source, Concept of polar curve, Calculation of luminance and illumination in case of linear source, round source and flat source

MODULE - III

Design of Interior Lighting : Definitions of maintenance factor, Uniformity ratio, Direct ratio, Coefficients of utilization and factors affecting it, Illumination required for various work planes, Space to mounting height ratio, Types of fixtures and relative terms used for interior illumination such as DLOR and ULOR, Selection of lamp and luminance, Selection of utilization factor, reflection factor and maintenance factor Determination of Lamp Lumen output taking into account voltage and temperature variations, Calculation of wattage of each lamp and no of lamps needed, Layout of lamp luminaire, Calculation of space to mounting height ratio, Indian standard recommendation and standard practices for illumination levels in various areas, Special feature for entrance, staircase, Corridor lighting and industrial building.

MODULE - IV

Design of Outdoor Street Lighting: Types of street and their level of illumination required, Terms related to street and street lighting, Types of fixtures used and their suitable application, Various arrangements in street lighting, Requirements of good street lighting, Selection of lamp and luminaire, Calculation of their wattage, Number and arrangement, Calculation of space to mounting height ratio, Calculation of illumination level available on road.

MODULE - V

Design of Outdoor Flood Lighting: Terms related to flood lighting, Types of fixtures and their suitable applications, Selection of lamp and projector, Calculation of their wattage and number and their arrangement, Calculation of space to mounting height ratio, Recommended method for aiming of lamp.

MODULE – VI

Special Features of Aesthetic Lighting : Monument and statue lighting, Sports lighting, Hospital lighting,Auditorium lighting

Energy Conservation codes for lighting; lighting controls – daylight sensors and occupancy sensors; controller design.

Text Books:

1. Concepts and practice of Architectural Day Lighting, by Moore, Fuller: Van NostrandReinholdco.,New York, 1985.
2. Designing with light: A Lighting H.B. International Lightning Academy, byValia, Anil:Mumbai, 2002
3. Concepts in Architectural Lighting, by David Egan. M:Mc Grew Hill Book company, New York, 1983
4. Architectural Lighting Design, by Gary Steffy, LC, IES, and field: Wiley; 2008.
5. Concepts in Architectural Lighting, by David Egan. M:Mc Grew Hill Book company, New York, 1983.
6. Architectural Lighting Design, by Gary Steffy, LC, IES, and field: Wiley; 2008.

Reference Books:

1. H. S. Mamak, Book on Lighting, Publisher International lighting Academy
2. Joseph B. Murdoch, Illumination Engineering from Edisons Lamp to Lasers Publisher - York, PA: Visions Communications
3. M. A. Cayless, A. M. Marsden, Lamps and Lighting, Publisher-Butterworth-Heinemann(ISBN978-0-415-50308-2)
4. Designing with light: Lighting Handbook., Anil Valia; Lighting System 2002.

BT21B5C5 BUILDING AUTOMATIONS AND CONTROLS

SEMESTER	Course Code	Course Title	L	T	P/S/F	C	Int. Marks	Ext. Marks	Total Marks
V	BT21B5C4	Building Automationsand Controls	2	2	-	3	50	50	100

COs	Course Outcomes	POs	BTLs
	The student will be able		
CO1	To study briefly on Building Management System and how to measure building Performance	1	2
CO2	To learn the components of Building Management Systems	1,3	2
CO3	To define the smart technologies in building control and automation and their case studies	3	2,4
CO4	To learn protocols in building automation system	1,3	2,4
CO5	To understand the concept of control theory	1,3	2,4
CO6	To study the integration of BMS	1	2

MODULE – I

Introduction: Concept of intelligent building and implementation strategies; Building management system (BMS);Communication in BMS; Communication system in buildings; vertical transportation; Power quality issues Building performance – Building management systems. Measuring Building Performance.

MODULE - II

Components: Sensors, Actuators, Controllers. Need for building controls, defining building automation, BMS function and control optimization; Direct Digital Control; Introduction of various concepts like Automation inacoustical design, illumination, water supply, fire-fighting, HVAC, emergency systems, etc. Effect on indoor environment and the global environment, Energy conservation benefits, Advantage of a BMS.

MODULE - III

Smart technologies, sensor technologies, building control and automation systems, and human-systems
relationships are explored. Case studies constitute an integral part of the module.

MODULE - IV

Protocols used in building automation:
Zig Bee, BACnet, Lon Talk, Modbus, DALI, C Bus, oBIX, DSI.
Electronic Systems in Buildings: Telephone and communication, EPABX networks, transmission. Security systems, Burglar alarms, video surveillance, access control. Computer labs, access flooring, server rooms.

MODULE - V

Control theory:
Simple proportional control, Proportional and differential controller (PD), Proportional Integral and Differential controller (PID).

MODULE - VI

Integration of BMS:

BMS in Light control, Transportation, Lifts and elevators, Air conditioning, Assess controlling, Fire systems. Introduction to BMS Network Infrastructure for building connectivity-Benefits of advancedbuilding cabling, Definitions, basic principles, building network infrastructure & design considerations.

Text books:

1. Intelligent Buildings and Building Automation by Shengwei Wang: Spon Press, London,2009
2. Understanding Building Automation Systems by Reinhold A. Carlson , Robert A. DiGiandomenico: R.S. Means Company, Inc. 1991.

Reference Books:

1. A guide for building and facility automation systems by John P. Cilia; Fairmont Press
2. Instrumentation & mech. Measurements by A. K. Tayal: Galgotia Publications.

BT21B5O1 FIRE PROTECTION EQUIPMENT APPLIANCES

SEMESTER	Course Code	Course Title	L	T	P/S/F	C	Int. Marks	Ext. Marks	Total Marks
V	BT21B5O1	Fire Protection Equipment appliances	2	-	-	2	100	-	100

COs	Course Outcomes	POs	BTLs
	The student will be able		
CO1	Identify & elaborate about different types inter locking couplings branch holders, Breechings, Adapters	5	2
CO2	Identify the different types of Electric circuit and Protective devices, Fire detection equipments in Buildings	5	2
CO3	Identify & elaborate about different types Sprinkler system, Water storage tanks, Fire protection Requirements in Buildings	5	2
CO4	Identify & elaborate about different types of Rope, Lines, Knots and ladders used in fire service	5	2
CO5	Explain operation uses/functions, Ladder, Pumps Primers Foam Making equipments	5	2
CO6	TO Gain the knowledge about First Aid in Fire Accidents	5	3

MODULE – I

Hose, Causes and prevention of shock, Causes and prevention of rubber acid, Couplings, Component parts of inter locking couplings, Suction coupling wrenches, Branches, nozzles and branch holders, Breechings, Adapters.

MODULE - II

Fire alarm, Introduction of Electronics and Electricity, Circuit Control and Protective Devices, Transistors, Principles of fire detectors, Principles of fire detectors, Type of detectors, Automatic fire detection, Classification of detector.

MODULE - III

Sprinkler system, installation of sprinkler system, piping and fittings. Pressure gauges, Installation of control valves, Maintenance of sprinkler installation, Fire protection requirements for buildings and riser system. Classification of buildings based on occupancy. Fire protection, static water storage tanks. Preparation of plans, Signs and symbols used in the drawing, Drawing instruments and their uses.

MODULE - IV

Trouble shooting and maintenance, Rope, Lines, knots and ladders, Cordage, Different type of knots, Purpose of knots, Ladders.
MODULE - V
Hook ladder, Escape ladder, turn table and extension ladder, SCBA and foam making equipments, Effects of respiration, Essential fetchers of BA set, Foam & foam making equipments, Pumps, primers, tenders and water relays.
MODULE - VI
Action at Emergency, the practice of First Aid, Control of bleeding, Burns and Scalds, Heart Attack, Disorder of Circulation, Dressing & Bandages, Handling & transport of injured.

Text Books: -

1.) Fire Safety In Building By: V.K. Jain Publishers: New Age International Publishers Edition: 2nd First Print – 1996 Re-print – 2002
2.) NFPA Handbook
3.) SFPE Hand book of Fire Protection Engineering

SEMESTER-VI

BT21B6S1 BUILDING SERVICES STUDIO-VI

SEMESTER	Course Code	Course Title	L	T	P/S/F	C	Int. Marks	Ext. Marks	Total Marks
VI	BT21B6S1	Building Services Studio-VI	2	6	-	8	100	100	200

COs	Course Outcomes	POs	BTLs
	The student will be able		
CO1	To study, analyze, design air-conditioning systems like heat load calculations, design of air distribution system, chiller piping systems applied to commercial buildings, hospitals, hotels, residential buildings etc.,	1,2, 3, 9, 11	2,3,5, 6

MODULE – I

Study and Analysis- Through literature studies and case studies analyze the constraints, typologies and interventions in Heat load calculation, types of air conditioning system, air distribution and pipe line system

Design Proposal- Design of a building project incorporating varied formats of grouping on an actual site with specific bye-laws and regulations, calculating – demand of Heat load, Selection of types of air conditioning system for a building, Duct and pipe calculations, Selection of fans, blowers, etc.,

Fundamental of HVAC

Basics of Heat Transfer: Standards and codes used in HVAC Study on Psychometric Charts (Manual and ASHRAE Analysis software). Properties of Air (Altitude, DBT, WBT, %RH, DPT, Humidity Ratio & Enthalpy).

Types

Heat load calculation

- Cooling & Heating Load Calculation
- General& E-20 manual calculation
- chiller load calculation,
- Fresh Air Handling Unit Designing as per ASHRAE 62.1.
- Winter load calculation Ventilation System Designing
- Ventilation and Infiltration Load Calculation

Selection of air condition systems

- All air systems
- All water systems
- Air- water systems

Air distribution systems

- Duct design consideration,
- Duct sizing methods,
- Duct sizing as per aspect ratio,
- Bill of materials for duct network,
- Gauge selection for sheet metal
- Calculation of number of sheets for duct

- Finding duct size using duct calculator
- Legends and symbols used in the HVAC industry,
- Selection of diffusers and grilles,
- Preparation of layouts (Double line diagram-DLD) as per SMACNA rules,
- Duct routing- preparation of single line diagram(SLD) ,
- Sectional drawing @Duct supports, Opening for ducts passing through wall.

Chiller piping design

- piping calculation
- piping design
- Selection of appropriate valves for the piping system
- Piping networking auto cad drawing

Case study

- Residential building
- Hospitals building
- Commercial building

Preparation of conduit, power, lighting and cable tray layouts at site level and building level, report containing calculations and specifications, catalogue reference for a gated community/resorts/hotels.

Expected Outputs & Assignment

- Major design problem: Literature review, Data collection, Case study and proposal for a hospital, manufacturing unit, resorts and hotels, commercial complex or office building. Any two minor design problems like gated community and residential building.

Text books:

1. Refrigeration and air conditioning, C.P.Aroura
2. ISHRAE Handbooks

Reference Books:

3. ASHRAE Handbooks
4. Refer CED online web site Refrigeration and air conditioning, Anathnarayan.

BT21B6P1 COMPUTER APPLICATIONS IN MEP

SEMESTER	Course Code	Course Title	L	T	P/S/F	C	Int. Marks	Ext. Marks	Total Marks
VI	BT21B6P1	Computer Application in MEP	-		3	3	50	50	100

COs	Course Outcomes	POs	BTLs
	The student will be able		
CO1	To access with basic concepts of MEP tool (Revit) in the computer.	1,3,5,9	2,3,6
CO2	To design and create HVAC design	1,3,5,9	2,3,6
CO3	To create Electrical design	1,3,5,9	2,3,6
CO4	To create piping and plumbing design	1,3,5,9	2,3,6
CO5	To design and create fire protection system	1,3,5,9	2,3,6
CO6	To integrate all the services, clash detection and rectifications	1,3,5,9	2,3,6

MODULE – I

Introduction to computer application programs in MEP, Basics of computers in MEP.

MODULE - II

HVAC models for design

Process of analyzing HVACs designs. Process of creating room color fills. Process of exporting GBXML Guidelines for exporting GBXML; process of using imported GBXML data. Guidelines for using imported GBXML data to color-fill rooms. Creating HVAC designs.

Creating HVAC designs

Process of adding mechanical parts. Guidelines for adding mechanical parts. Process of creating a supply system process of inspecting a system. Guidelines for inspecting a mechanical system, process of routingpiping. Guidelines for routing piping process of creating duct routing in a return system.

MODULE - III

Creating Electrical designs

Process of creating electrical designs process of adding electrical devices to your design; guidelines for adding electrical devices; process of creating circuits; guidelines for creating circuits. Process of setting up an electrical distribution. Guidelines for setting up electrical distribution circuits. Process and guidelines of creating a lighting fixture family.

MODULE - IV

Creating Piping System:

Process of creating a piping system; guidelines for creating a piping system. Create a hydraulic supply piping system.

Creating Plumbing Systems:

Process of creating a plumbing system; guidelines for creating a plumbing system; create a plumbing sanitary system.

MODULE - V

Creating Fire Protection Systems: Process of creating a fire protection system; guidelines for creating a fire protection system; create a fire protection system.
MODULE - VI
Co-ordination of MEP services: Integrating all the services- Electrical, HVAC, Plumbing and Fire fighting in a Building. Clash detection and rectifications.

Text books:

1. User Guide Autodesk – 2017
2. ASHRAE Handbook

Reference Books

1. ISHRAE HVAC Handbook

BT21B6P2 ENERGY SIMULATION AND MODELING

SEMESTER	Course Code	Course Title	L	T	P/S/F	C	Int. Marks	Ext. Marks	Total Marks
VI	BT21B6P2	Energy Simulation and Modeling	-	-	3	3	50	50	100

COs	Course Outcomes	POs	BTLs
	The student will be able		
CO1	An understanding of the background of building performance simulation.	1,5,9	2,3,6
CO2	An understanding of requirements about thermal and visual comfort and indoor air quality, and of their relationship with energy usages in buildings.	1,2,5,9	2,3,6
CO3	An understanding of integrating passive strategies and renewable energy generation systems in a building model.	1,2,5,9	2,3,6

MODULE – I

Course Introduction and Background
Brief history, need for simulation, and simulation as part of design process-various methods in simulation process, data collection, the variables which effect energy consumption in buildings.

MODULE – II

Fundamentals of energy
Mass transfer and Thermal analysis of building components, Numerical methods, and Theoretical framework for energy simulation for buildings related to various aspects Energy simulation tools.

MODULE - III

Energy Analysis & Simulation
Software programs for energy simulation modeling (appropriate software); Geometry modeling, Peak heating loads calculation; Loads simulation modeling-1, Peak heating loads calculation; Loads simulation modeling-2, Peak cooling loads calculation; Loads simulation modeling-3, Annual cooling energy calculation; Loads simulation modeling-4, Heating and cooling energy calculations & Simulation modeling.

MODULE - IV

Building Energy evaluation
Building energy use characteristics; Psychrometric analysis for thermal energy analysis; Systems simulation-1, Weather data analysis: Weather normalization; Energy consumption prediction; Energy performance evaluation; Systems simulation-2, Energy supply systems & Systems simulation modeling, Energy Use Intensity (EUI) analysis; CBECS/RECS, ASHRAE 90.1, LEED, & IPMVP; Whole building simulation-1

MODULE - V

Energy savings analysis; Performance evaluation; Human comfort analysis Using Software

MODULE - VI

Introduction to Energy Plus interface tools. Linking energy models to other tools, BIM - Energy Plus, setting up from Revit or Sketch-up

Text books:

1. Building Energy Simulation. A Workbook Using Design Builder. By Vishal Garg,Jyothirmayi Mathur, Surekha Tetali, Aviruch Bhatia
2. Software tool application guides for above software
3. Building Performance Simulation for Design and Operation by J. Hensen and R. Lamberts(eds.). Publisher: Routledge (February 24, 2011).

Reference Books:

1.ASHRAE Std 90.1-2007.
2.Software - E-Quest, Energy Plus, Design Builder

BT21B6K1 SKILL ENHANCEMENT COURSE-4

SEMESTER	Course Code	Course Title	L	T	P/S /F	C	Int. Marks	Ext. Marks	Total Marks
VI	BT21B6K1	Fundamentals of IOT	2	-	-	2	100	-	100

COs	Course Outcomes	POs	BTLs
	The student will be able		
CO1	Understand the various concepts, terminologies and architecture of IoT systems	1,2	
CO2	Use sensors and actuators for design of IoT	1,2	
CO3	Understand and apply various protocols for design of IoT systems	1,2,3	
CO4	Use various techniques of data storage in IoT	1,2	
CO5	Understand various data analytics in IoT	1,3	
CO6	Understand various applications of IoT	2,3	

MODULE – I

Introduction to Sensor Networks, unique constraints and challenges, Advantage of Sensor Networks, Applications of Sensor Networks, Types of wireless sensor networks

MODULE – II

Mobile Ad-hoc Networks (MANETs) and Wireless Sensor Networks, Enabling technologies for Wireless Sensor Networks. Issues and challenges in wireless sensor networks.

MODULE - III

Introduction to IoT, Definitions & Characteristics of IoT, IoT Architectures, Physical & Logical Design of IoT, Enabling Technologies in IoT, History of IoT, About Things in IoT, The Identifiers in IoT, About the Internet in IoT, IoT frameworks, IoT and M2M

MODULE - IV

Wireless Technologies for IoT: WPAN Technologies for IoT: IEEE 802.15.4, Zigbee, HART, NFC, Z-Wave, BLE, Bacn Modbus

MODULE - V

Based Protocols for IoT IPv6, 6LowPAN, RPL, REST, AMPQ, CoAP, MQTT. Edge connectivity and protocols

MODULE - VI

Applications of IoT: Home Automation, Smart Cities, Energy, Retail Management, Logistics, Agriculture, Health and Lifestyle, Industrial IoT, Legal challenges, IoT design Ethics, IoT in Environmental Protection.

TEXT BOOKS:

1. Hakima Chaouchi, — —The Internet of Things Connecting Objects to the Web‖ ISBN : 978-1-84821-140-7, Wiley Publications

2) Olivier Hersent, David Boswarthick, and Omar Elloumi, — —The Internet of Things: Key Applications and Protocols‖, WileyPublications

3) Vijay Madisetti and ArshdeepBahga, — —Internet of Things (A Hands-on-Approach)‖, 1 st Edition, VPT, 2014.

4) J. Biron and J. Follett, "Foundational Elements of an IoT Solution", O'Reilly Media, 2016

BT21B6C1 GREEN BUILDING

SEMESTER	Course Code	Course Title	L	T	P/S /F	C	Int. Marks	Ext. Marks	Total Marks
VI	BT21B6C1	Green Building	3	-	-	3	50	50	100

COs	Course Outcomes	POs	BTLs
	The student will be able		
CO1	To understand the concept of "what is a green building?"	6	1
CO2	To assess the steps involved in site selection and plan accordingly	3,4	4
CO3	To relate water efficiency in buildings	3,6	1
CO4	To summarize energy efficiency in buildings and study the codes forenergy efficiency	1,4	2
CO5	To efficiently manage material and resource handling at site so that will benefit the society and environment	1,6	3
CO6	To study on improving indoor environmental quality and performdesktop studies on green buildings	1,6	5

MODULE – I

Concept of Green Buildings

Green Building and initiatives, its origin, characteristics of a green building, Green buildings in India,certification of green buildings rating systems (BREEAM, USGBC, LEED, IGBC, TERI-GRIHA) criteriafor rating, sustainability.

MODULE - II

Site Selection and Planning

Site selection, local building regulation, preserving and protection of natural landscape during construction, Soil conservation, Design to include existing site features.

MODULE - III

Water Efficiency

Efficient water use during construction, Rainwater harvesting- Roof and non-roof, Waste water reuse, water efficient plumbing fixtures, water metering.

MODULE - IV

Energy Efficiency

Optimizing building design to reduce conventional energy demand, On-site renewable energy, Solar water heating systems, ECBC codes for energy efficiency, Energy metering.

MODULE - V

Materials and Resources

Efficient Segregation of waste, Handling of construction waste. Reuse of salvaged materials, use of Recycled construction materials, Alternative building materials, local materials, rapidly renewable building materials and wood.

MODULE - VI

Indoor Environmental Quality

Enhanced fresh air ventilation, Exhaust systems, Low VOC materials, paint & adhesives, Enhanced daylighting, Tobacco control.

Desktop studies of few green buildings of different typologies.

Text books:

1. Indian Green Building Council (IGBC) Abridged Manuals.
2. Green Rating & Integrated Habitat Assessment (GRIHA) Manuals.
3. Sustainable Building Rating Systems,by K.M.Fowler, E.M.Rauch , July 2006 ,PacificNorthwestNational Laboratory, U.S Department of Energy.
4. Sustainable Construction by Kibert.

Reference Books:

1. Complete Guide to Green Buildings by Trish riley
2. Standard for the design for High Performance Green Buildings by Kent Peterson, 2009.

BT21B6C2 O & M OF BUILDING SERVICES

SEMESTER	Course Code	Course Title	L	T	P/S /F	C	Int. Marks	Ext. Marks	Total Marks
VI	BT21B6C2	O & M of Building Services	3	-	-	3	50	50	100

COs	Course Outcomes	POs	BTLs
	The student will be able		
CO1	To understand the concept of Operation and Maintenance (O & M) Management, importance of maintaining buildings and services in different atmospheric condition.	2,3,7	2,6
CO2	To understand the concept of Operation and Maintenance of Watersupply systems	2,3,7	2,6
CO3	To understand the concept of Operation and Maintenance of pumping stations, water treatment plants	2,3,7	2,6
CO4	To understand the concept of Operation and Maintenance of Sewerage Systems	2,3,7	2,6
CO5	To understand the concept of Operation and Maintenance of Electrical installations	2,3,7	2,6
CO6	To understand the concept Operation and Maintenance of mechanical installations	2,3,7	2,6

MODULE – I

Operation and Maintenance (O & M) Management, importance of maintaining buildings and services, Testing and evaluation of Buildings and services, Check lists for handing over and taking over. Importance of seasonal maintenance: pre-monsoon and post-monsoon activities, Effects of non-maintenance, Manpower and material planning for O&M, Budgeting for O&M.

MODULE - II

Maintenance of Water supply systems, Relationship between water supplies and health, standards for
water supplies, quality monitoring of drinking water supply, protection of sources of water supply.

MODULE - III

O & M of pumping stations, water treatment plants, chlorination practices, maintenance of ground level
and elevated tanks, leakage detection survey, O & M of swimming pools, O & M of Kitchen Services.

MODULE - IV

Maintenance of Sewerage Systems, Sewer cleaning equipment and devices, O & M of Sewage pumpingstations, Sewage Treatment, Septic Tanks. Stabilization ponds, Activated Sludge Processes, Filters,
Oxidation ditches, Effluent disposal and utilization.

MODULE - V

Maintenance of Electrical installations, substation equipment inspection and preventive maintenance schedules, Earthling System Checks, O & M of DG Sets, Cables, UPS systems, Lifts & Escalators, Motorsand Fire Detection systems.
MODULE - VI
O & M of AC and Refrigeration systems, compressors, condensers, pumps, cooling towers, Air HandlingUnits, Electrical circuits and controls for AC plants, clean rooms, operation and monitoring, Low humidity rooms.

Text books:

1. Facility Manager's Operation and Maintenance Handbook by Bernard Lewis: Mc Graw Hill
2. Facilities Maintenance Management by Gregory H. Magee:R.S. Means Company

Reference Books:

1. Building Maintenance Management by Barrie Chanter and Peter Swallow.
2. Building Maintenance Processes and Practices by Abdul Lateef Olanrewaju Abdul-Rashid Abdul-AzizSpringer Publications.

BT21B6C3 ESTIMATION, COSTING AND SPECIFICATION

SEMESTER	Course Code	Course Title	L	T	P/S/F	C	Int. Marks	Ext. Marks	Total Marks
VI	BT21B6C3	Estimation, Costing and Specification	2	2	-	3	50	50	100

COs	Course Outcomes	POs	BTLs
	The student will be able		
CO1	To understand techniques of estimation and costing quality surveying.	4,5	3,4
CO2	To understand techniques of estimation and costing rate analysis and specification of building materials.	4,5	3,4
CO3	To understand techniques of Estimation, Costing and Specifications for Plumbing Services.	4,5	3,4
CO4	To understand techniques of Estimation, Costing and Specifications for Electrical Services.	4,5	3,4
CO5	To understand techniques of Estimation, Costing and Specifications for HVAC Services.	4,5	3,4
CO6	To understand techniques of Market Survey.	4,5	3,4

MODULE – I

Quantity Surveying: Introduction - Definitions and terms used, principles, units of measurements. Methods of preparing approximate estimates, basic differences and advantages, detailed estimation for Building Services: Method of obtaining detailed quantities of building items for MEP adopting PWD guideline.

Obtaining all items from selection of equipment to commissioning of the services at the site - Case studyof construction site.

MODULE – II

Rate analysis: Cost of materials and labor for various works, data sheet for different items of works, different methods of execution & installation and commissioning of services i.e., piece work, daily basis, lump sum, labor rates and percentage etc.

Specifications: definition, purpose and importance of specifications, factors on which specifications depend, types of specifications, specification writing for MEP services.

MODULE – III

Estimation, Costing and Specifications for Plumbing Services

Type of pipes used, Pipe fittings, Valves, Pumps and their fittings, laying of water supply and sanitary pipes, construction of water harvesting pits, sump, and OHT etc., Sanitary fixtures, Traps, Gully andInspection chambers construction quantity, Trenches & Harvesting pit and STP construction quantity.

MODULE – IV

Estimation, Costing and Specifications for Electrical Services

Types of Lights, Electrical and Lighting fixtures, Switch and Switch boards, Electrical appliances, Wiring, Cables, Conduits, Cable trays and their fittings, MCB's, Energy Meters, Distribution Panels, Transformers, DG Sets, Lighting arresters and their fittings.

MODULE – V

Estimation, Costing and Specifications for HVAC Services Indoor units, Outdoor unit, copper pipes and their fittings, Diffusers, grills, etc., AHU, FCU, Duct and their fittings, Insulation, Dampers, Chillers, Filters, Pumps and their fittings, Valves, Ducting.
MODULE – VI
Market Survey Detailed market survey on overall cost of materials, Equipment's, Fittings, etc.

Text books:

1. Estimating and Costing in Civil Engineering: Theory and Practice, by Datta, 23rd edition, B.N.:UBS Pub. Distributors Ltd., New Delhi, 1993.
3. Estimating and Costing, by Bride, 2nd edition, G.S: Dhanpat Rai and Sons, Delhi, 1982.
4. Standard Specification and rates, Government of Andhra Pradesh,Government Press, Hyderabad Indian Standards Institution.

Reference Books:

1. National Building Code of India 2005: Indian Standards Institution, New Delhi, 1984.
2. Specification in Detail, by Macey, 5th edition, W. Frank: Technical Press ltd, London, 1955.

BT21B6E1 ENERGY AUDITING

SEMESTER	Course Code	Course Title	L	T	P/S/F	C	Int. Marks	Ext. Marks	Total Marks
VI	BT21B6E1	Energy Auditing	3	-	-	3	50	50	100

COs	Course Outcomes	POs	BTLs
	The student will be able		
CO1	To study the concept of energy management, optimization and energy audit instruments	1	2
CO2	To understand the electrical system and study electrical lighting load and power load	3,7	3
CO3	To know about Energy Efficient Technologies in Electrical Systems and their potentiality in energy saving	3,7	3
CO4	To know the different parameters of compressed ir HVAC and Refrigeration system	3,7	3
CO5	To give a brief description on Vapor absorption ,refrigeration system, Fansand blowers ,Pumps and Pumping System, Cooling Tower and their energy conserving opportunities	3,7	2
CO6	To study the concept of energy management, optimization and energy audit instruments	1	2

MODULE – I

Energy Management & Audit:
Definition need and types of energy audit. Energy management (audit) approach-understanding energy costs, bench marking, energy performance, matching energy use to requirement, maximizing system efficiencies, optimizing the input energy requirements, fuel & energy substitution, energy audit instruments.

MODULE - II

Electrical system:
Electricity billing, electrical load management and maximum demand control, power factor improvement and its benefit, selection and location of capacitors, performance assessment of PF capacitors, distributionand transformer losses

Electrical Lighting Load:
Light source, choice of lighting, luminance requirements, and energy conservation avenues.

Electrical Power Load:
Types, losses in induction motors, motor efficiency, factors affecting motor performance, rewinding andmotor replacement issues, energy saving opportunities with energy efficient motors.

MODULE - III

Energy Efficient Technologies in Electrical Systems:
Maximum demand controllers, automatic power factor controllers, energy efficient motors, soft starters with energy saver, variable speed drives, energy efficient transformers, electronic ballast, occupancy sensors, energy efficient lighting controls, energy saving potential of each technology.

MODULE - IV

Compressed Air System:
Types of air compressors, compressor efficiency, efficient compressor operation, Compressed air systemcomponents, capacity assessment, leakage test, factors affecting the performance and saving opportunities **HVAC and Refrigeration System**:
Vapor compression refrigeration cycle, refrigerants, coefficient of performance, capacity, and factors affecting Refrigeration and Air conditioning system performance and saving opportunities

MODULE – V

Vapor absorption refrigeration system:
Working principle, types and comparison with vapor compression system, saving potential.
Fans and blowers: Types, performance evaluation, efficient system operation, flow control strategies and energy conservation opportunities.
Pumps and Pumping System: Types, performance evaluation, efficient system operation, flow control strategies and energy conservation opportunities.
Cooling Tower: Types and performance evaluation, efficient system operation, flow control strategies andenergy saving opportunities assessment of cooling towers.

MODULE - VI

Energy conservation in buildings and energy conservation building codes (ECBC):
Energy conservation buildings codes (ECBC) norms, building envelope, insulation, lighting, heating, ventilation, air conditional (HVAC), fenestrations, water supply, and energy storage/ captive generation, elevators and escalator,starlabeling for existing buildings, energy service companies based case studies.

Text books:

1. Energy Management Hand Book, Sixth edition, by W.C. Turner & SteveDoty: Fairmont Press, Inc.
2. Energy Management Principles, by CB Smith: Pergamon Press
3. Energy Management by W.R. Murthy and G.Mc. Kay : BS Publication.

Reference Books:

1. Turner, W. C., Doty, S. and Truner, W. C., Energy Management Hand book, 7th edition,Fairmont Press, 2009.
2. De, B. K., Energy Management audit & Conservation, 2nd Edition, Vrinda Publication,2010.
3. Industrial Energy Management and Utilisation -L.C. Witte, P.S. Schmidt, D.R. Brown(Hemisphere Publication, Washington, 1988)
4. Industrial Energy Conservation Manuals, MIT Press, Mass, 1982
5. Energy Conservation guide book Patrick/Patrick/Fardo (Prentice hall1993).

BT21B6E2 SAFETY HEALTH & ENVIRONMENT

SEMESTER	Course Code	Course Title	L	T	P/S/F	C	Int. Marks	Ext. Marks	Total Marks
VI	BT21B6E2	Safety Health& Environment	3	-	-	3	50	50	100

COs	Course Outcomes	POs	BTLs
	The student will be able		
CO1	To understand the basic concept of Safety Health & Environment	4,6	2
CO2	To study the concept of material handling safety in buildings and at construction site	1	4
CO3	To explore the concept of risk assessment and prevention	1,3	4
CO4	To Make them ready how to respond in case of emergency situations and also study emergency site plans	3,4	3,4
CO5	To Get the knowledge on firefighting system in buildings based onquality standard and norms	1,4, 2	1,2
CO6	To learn about firefighting equipment and necessary steps involved infire management	4,6	3,4,5

MODULE – I

Introduction to Safety Health and Environment, Occupational Health (hygiene and safety), recognitionand evaluation of Occupational Hygiene (noise, illumination, Heat & climate, toxic substances, etc.),
ergonomics & safety control, standard and regulation.

MODULE - II

Material handling safety, Electrical Hazards and Safety, Construction Safety, Machine guarding, confined space entry, Acid area entry permit. Safety at construction site, hazards, handling and storage of compressed gas, excavation work, concreting and cementing work, transportation of men and material,
waste control disposal.

MODULE – III

Signage, Safe Condition, Prohibition, Warning, Fire Equipment, Fire Exit Signs, Risk Assessment (exposure, hazard & risk), Purpose of Risk Assessment, Prevention of risk, Risk Assessments, Health risks, Safety task analysis risk reduction talk. Health & Safety Management implementation and operational Noise Slips, Trips, Leak Chemicals Manual Handling First Aid PPE Fire.

MODULE – IV

Health & Safety Culture

Safety aspects, planning, environmental aspects, legal and other requirement, Structure and Responsibility, Health Safety control, unsafe practice, Operational Good Practice. Emergency preparedness and response, Procedures for identifying potential accident and emergency situations, Accident and emergency response procedures, Site emergency plans

MODULE – V

Appropriate firefighting equipments, fire detection, smoke and heat detection alarms should be incorporated in the design, The fire-fighting equipment as per quality standards and norms should be used. Fire Water Hydrant System, Fire Extinguishers, Fire Protection System, Fire Detection System Equipments. Fire tetrahedron,
MODULE – VI
Classification of fire type, Local equipment firefighting equipments (fire hose box, fire man axe, firebeater, fire hook, fire bucket,) Type of extinguisher installation & maintenance. Fire safety rules NBC &TAC norms

Text books:

1. Occupational safety and health management. by Anton.T, New York McGraw-Hill, 1989.
2. Health, Safety, premises and Environment, Workplace Law Handbook, 2nd edition, koganpage.

Reference Books:

3. Occupational health and safety management: a practical approach by Reese, C, BocaRaton, Fla: Lewis, 2003.
4. Sustainable Practice foe the Facilities Manager by Sunil Shah, Blackwell Publishing.

BT21B6E3 PROJECT MANAGEMENT

SEMESTER	Course Code	Course Title	L	T	P/S/F	C	Int. Marks	Ext. Marks	Total Marks
VI	BT21B6E3	Project Management	3	-	-	3	50	50	100

COs	Course Outcomes	POs	BTLs
	The student will be able		
CO1	To study the importance of project management and life cycle of project	11,12	2
CO2	To label the parameters in project management framework	3,11	1
CO3	To tell about the project management information system and do thecase studies	1,1	1
CO4	To learn the project management strategies	11,12	2,3
CO5	To relate the technology management in project to meet build ability and quality standard	11,12	2,3
CO6	To develop plan on project scheduling and case study	5,11	6

MODULE – I

Introduction to Project Management:
Definitions and meanings; importance of project management, Reasons or shortfall in its performance,
scientific management, Different types of project, life cycle of project.

MODULE - II

Project Management Frame Work, Project Scope management, Project Time Management-crashing and crunching, Tools and Techniques of Time Management, Project Cost Management. Procurement of Construction Services. The Construction Process. Project Control Using earned value techniques. Project Human Resource Management.

MODULE - III

Project Communication Management. Project close-out acceptance and commissioning. Project Management Information System. Causes of Project Failure. Exercises, Tutorials and Case Studies.

MODULE - IV

Project Management Strategies: Tools and Techniques for project management. Mission, Goals, Objectives, Policy, Strategy, Programmers, Value Chain Analysis, SWOT Analysis, Steps in Strategy Formulation and Implementation, Generic Strategy alternatives. Integrated reporting system, flow diagrams, bar, charts, milestone, charts, CPM and PERT, LOB. Techniques of monitoring of development works-standard oriented costs control, turnkey system, vertical production method, inventory cost control techniques, and unified status, index techniques.

MODULE - V

The management of technology relating to development projects to meet regulatory requirements, andprevailing build-ability and quality standards. The topics include preliminary works, substructures, and

structural systems, functional elements for reinforced concrete and structural steel buildings, and externalworks.
MODULE - VI
Management of development technology for projects like Building Operations and Works of Engineering Construction. Regulations, Building Control Regulations, Buildable Design Appraisal System, Construction Quality Assessment System and other relevant codes of practice. Assessment of clients' requirements, selection of projects, formulation of project brief, the role of design as well as the designer in projects, design for value, integrated designs, and design evaluation. **Case study**: Develop/Plan on project scheduling using MSP (Microsoft Project Management) or any otherrelevant software.

Text books:

1. Introduction to Management Science by Bernard W. Taylor.
2. Project Management (Management Extra) by Elearn

Reference Books

1. Project Management in construction by Anthony Walker.
2. Projects by Prasanna Chandra
3. Urban construction project management – publication: Mcgraw Hill.

BT21B6O1 BUILDING CODES (NBC,ECBC, IBC CODES)

SEMESTER	Course Code	Course Title	L	T	P/S /F	C	Int. Marks	Ext. Marks	Total Marks
VI	BT21B6O1	Building Codes (NBC, ECBC, IBC Codes)	2	-	-	2	100	-	100

COs	Course Outcomes	POs	BTLs
	The student will be able		
CO1	Studying fire fighting, plumbing, lighting and ventilation concepts in NBC	1,4	2,3,4
CO2	Studying electrical, air-conditioning, mechanical circulation system concepts in NBC	1,4	2,3,4
CO3	Studying scope, building envelope and HVAC concepts in ECBC	1,4	2,3,4
CO4	Studying service hot water and pumping, lighting, electric power concepts in ECBC	1,4	2,3,4
CO5	Studying Introduction to Eco Niwas samhita 2021	1,4	2,3,4
CO6	Studying Introduction to International Building Codes	1,4	2,3,4

MODULE – I

National Building Codes: In building projects various services aspects like fire and life safety; plumbing services; lighting and natural ventilation;

MODULE – II

National Building Codes: Electrical and allied installations; air-conditioning; heating and mechanical ventilation; installations of lifts and escalators

MODULE – III

ECBC: Scope and administration, Building Envelope, HVAC

MODULE – IV

ECBC: Service hot water and pumping, lighting, electric power;

MODULE – V

An Introduction to Eco Niwas samhita 2021

MODULE – VI

Introduction to International Building Codes

Text Books:

1.National Building Codes Volume 1&2 by bureau of Indian Standards

2. Energy Conservation Building Codes, Published by Bureau of energy efficiency 2009, New Delhi.

3. IBC 2021 by International Code Council.

SEMESTER-VII

BT21B7S1 BUILDING SERVICES STUDIO-VII

SEMESTER	Course Code	Course Title	L	T	P/S/F	C	Int. Marks	Ext. Marks	Total Marks
VII	BT21B7S1	Building Services Studio-VII	2	6	-	8	100	100	200

COs	Course Outcomes	POs	BTLs
	The student will be able		
CO1	Acquainting with various ways of designing green building, retrofitting ofexisting buildings and understanding different types of rating systems in green building.	1,4,9	1,3,4

MODULE – I

Study and Analysis- Through literature studies and case studies analyze the rating systems for green buildings, energy, water efficient design strategy and design intent for green buildings.

Design Proposals: Design of buildings or retrofitting the existing building with green building features. Design to be represented in the form of schematic layouts, detailed estimates and report on working process. Design has to be evaluated against the base case of the appropriate category in green buildings.

Sustainable Design: Concept of sustainable design, site selection and planning: Building regulations (ECBC, GRIHA, and IGBC), Building materials and services in sustainable buildings.

Water Conservation: Rain water harvesting, calculating storm water quantity, pervious and impervious ground covers, estimation of capacity required for rain water harvesting and water efficient and waterless fixtures. Grey water recycling.

Energy Efficiency for Existing Buildings and New Buildings: Sources of energy -On-site and Off- site, calculation of energy from renewable sources, making alterations to the existing buildings (Retrofitting), base case for energy in different typologies of buildings. Energy efficient design for thermal comfort, mechanical equipment and electrical systems. Energy efficient equipments and fixtures. Building automation for energy efficient performance.

Building Material and Resource: Certified green building materials, Reduce reuse and recycling of materials, sustainable building materials, low embodied energy and low carbon materials, Life cycle assessment of building materials.

Indoor Environment: Importance of work environment and its relation to productivity, Indoor environmental quality, sick building syndrome, minimum fresh air ventilation, number of air cycles, odour, smoke and Co_2 monitoring, detecting and control of chemicals (VOC,CFC) and bacteria in indoor environment.

Luminous environment, day lighting, artificial lighting, task lighting, suitability for functional spaces, Occupational Safety and Health Hazards, Thermal comfort, indoor temperature and relative humidity, Noise pollution and control measures, Low emitting materials- Formal-dehyde, Volatile organic

compounds, CFC, Lead and other chemical pollution causing materials.

Innovation and Development: Design process: Optimization of design in all the above aspects.

Expected Outputs & Assignment:

Students are required to undertake case studies of green buildings and do detailed critical study on all the above aspects. This shall be presented through drawings, photographs, reports etc. in the studio. The students will also prepare a report on the case study and design for the viva voce. At least one major exercise (one problem should be pertinent to green buildings) and two minor problems should be given (at least one should be on interiors). The student has to prepare a comprehensive portfolio including details and their integration with the facilities.

***Note*:** The topics not covered in case studies may be covered by the studio faculty members through lecture/slide shows. Informal talks by practicing developers, architects, contractors, lawyers, engineers and financiers on topics relating to facility management. In end exam which is a viva-voce the students have to present the entire semester work for assessment

Necessary theoretical inputs to be given highlighting the norms and design issues.

Text books:

1. Green Building Fundamentals by Mike Montoya
2. National Green Building Standard by International Code Council and National Association ofHome Builders
3. Green Building through Integrated Design (Green Source Books) (Mcgraw-Hill's Greensource) by Jerry Yudelson
4. Mega Structures: the largest indoor parks and malls (Easy Read Large Bold Edition) by Susan K. Mitchell
5. Designing the Exterior Wall: An Architectural Guide to the Vertical Envelope – HardcoverbyLinda Brock (Jun 20, 2005)

Reference Books:

1. Sustainable Development by Kibert
2. Indian Green Building Codes (IGBC) Abridged versions 3.Energy Conservation Building Codes (ECBC) Norms 4.Green Integrated Habitat Assessment ((GRIHA) Manual.

BT21B7P1 PRE-THESIS SEMINAR

SEMESTER	Course Code	Course Title	L	T	P/S/F	C	Int. Marks	Ext. Marks	Total Marks
VII	BT21B7P1	Pre-Thesis Seminar	3	-	-	2	100	-	100

COs	Course Outcomes	POs	BTLs
	The student will be able		
CO1	To develop the theme and structure of the thesis by writing a preliminarythesis proposal. To acquire necessary resources for research and writingTo obtain appropriate bibliographic material To develop a timetable for researching and writing the thesis To provide support for the student's individual writing and assist in preparation of the thesis manuscript To officially submit a final, complete thesis according to Department andUniversity norms in partial fulfillment of the degree requirements.	1,3,6, 9,11	1,3, 6

MODULE – I

Introduction to project, difference between project and studio exercise literature and research papers, selection of topics for thesis, project thesis based on research / literature studies, preparation of synopsis, methodology of design thesis.

MODULE - II

Emerging concepts in building technology and services, reviews of project related to building technology and services, review of project complexities involving theme, sub theme, technology etc.

MODULE - III

Tools and methods to handle the project, field work, lab experiments, modeling techniques, Data analysis techniques, interpretation of data.

MODULE - IV

Background / prior work

List the main relevant work by others and/or results you have achieved in your previous work investigations.

i. Format for presentation of data, case study and analysis
ii. Format for presentation seminar paper, drawing and simulation models.

Report writing: techniques in report writing, presentation of contextual information relevant to interpretation of data collected. Explain the relation of the thesis topic to the exiting knowledge in the form
of coherently return thesis.

B**T21B7P2 WORKSHOP MEP**

SEMESTER	Course Code	Course Title	L	T	P/S/F	C	Int. Marks	Ext. Marks	Total Marks
VII	BT21B7P2	Workshop MEP	-	-	3	3	50	50	100

COs	Course Outcomes	POs	BTLs
	The student will be able		
CO1	To learn underlying concepts, modeling inputs and analysis methods of Plumbing tools, design development and evaluation and minor repair in plumbing.	1,4,12	1,2,3
CO2	To learn underlying concepts, modeling inputs and analysis methods of electrical tools, design development and evaluation and minor repair in electrical services in building.	1,4,12	1,2,3
CO3	To learn underlying concepts, modeling inputs and analysis methods of Mechanical tools, design development and evaluation and minor repair inMechanical services in building.	1,4,12	1,2,3

MODULE – I

Plumbing workshop:

Pipe cutting : Use of pipe cutters; Thread of pipes; Connection of fitting such as to pipes; Use of valve and unions; Function of pipes fitting: Use of hand tools; Pipe wrench; Chain wrench; Caulking tools; etc. Threading of PVC pipes. Connection of PVC pipes by connecting materials and by threaded pipes fitting Bending of PVC pipes. Minor repairs in plumbing.

MODULE - II

Electrical Workshop:

Study of symbol, specification and approximate cost of common electrical accessories, tools and worse &cables required for domestic installation. Study of a) Basic electricity rules for a domestic consumer b Safety precaution & use of Firefighting equipments.

Use of series of phase tester, series test lamp tong test and measure in testing of electrical installation. a Prepare of potential divider and measure resistance of a filament lamp using voltmeter and meter. b Measurement of power and energy consumption by and electric heater using wattmeter and energy meter.

Preparation of wiring diagram, wiring testing, fault finding& costing for a) Control of one lamp by on switch (using batten and tumbler switch b) Control the staircase wiring (using batten and tumbler switch c) Control of one bell buzzer indenter by one switch (using conduit and flush type switch). Prepare on Switchboard as per institutional requirement (using flush type switches. Sockets, MCB, ELCB, etc.)

Study Connecting testing and fault finding of a) Fluorescent rube and its necessaries b) Ceiling fan with resistance type and electronic regulator

Study Connecting testing and fault finding of a) Automatic electric Iron. b) Air Cooler c) Electric waterpump Design Draw and estimate the material required for installation for A small residential Building/ Office hall.

MODULE - III

Mechanical workshop:

Air refrigeration systems, air craft air-conditioning systems and their performance. Vapour compression cycles - simple, multi-pressure and cascade systems. Vapour absorption systems - Aqua-ammonia, water- lithium bromide and Electrolux systems. Refrigerants and their uses, primary and secondary refrigerants, designation and properties, Ozone Depletion Potentiality (ODP) and Global Warming Potentiality (GWP) of refrigerants.

Refrigeration equipment. Air conditioning processes, cooling load calculations, air conditioning systems and equipment. Concept of effective temperature and effective sensible heat factor (ESHF), requirement ofcomfort air conditioning.

Solar refrigeration and air conditioning systems. Household refrigeration, water cooler, window air conditioner and desert coolers.

Mechanism of operation of lifts and escalators.

Text books:

1. Principles of Electrical Engineering by V.K Mehta: S.Chand Publications.
2. Essentials of Electrical and Computer Engineering by David V. Kerns, JR. J. David Irwin Pearson: Pearson; 2nd edition ,2004

Reference Books:

3. Building Services hand book by Fred hall and RoserGreeno. Sixth Edition
4. Building Services Engineering By David V. Chadderton
5.

BT21B7P3 BUILDING SIMULATIONS AND MODELING

SEMESTER	Course Code	Course Title	L	T	P/S/F	C	Int. Marks	Ext. Marks	Total Marks
VII	BT21B7P3	Building Simulation and Modeling	-	-	3	3	50	50	100

COs	Course Outcomes	POs	BTLs
	The student will be able		
CO1	To recognize various building energy simulation tools, types and capabilities.	4,5	1,2
CO2	To learn underlying concepts, modeling inputs and analysis methods of Creating and Editing Geometry Of Different Modeling Tools for Designers and Architects.	4,5	1,2
CO3	To learn underlying concepts, modeling inputs and analysis methods of Modeling and Editing..	4,5	1,2
CO4	To learn underlying concepts, modeling inputs and analysis methods of Precision modeling	4,5	1,2
CO5	To model building performance using energy simulation software	4,5	1,2
CO6	To learn underlying concepts, modeling inputs and analysis methods of building components such as envelope, lighting, occupants, equipment, process loads, HVAC and service hot water systems.	4,5	1,2

MODULE – I

Rhinoceros 5 :
Modeling Tools for Designers and Architects
To create, edit, analyze, document, render, animate, and translate NURBS curves, surfaces, and solids with no limits on complexity, degree, or size. Rhino also supports polygon meshes and point clouds. Its accuracy and flexibility makes it possible to students to explore and build their ideas without having to spend much time learning.

MODULE - II

Creating and Editing Geometry:
Drawing free-form curves, Grid Snap, Layers, Selecting objects, dedicated selection commands. Object types Surface, Poly-surface, Solid, Lightweight Extrusion Objects, Curve, Polygon, and Mesh.
Editing Geometry:
Fillet, Blend ,Chamfer ,Move ,Copy ,Undo and Redo ,Rotate ,Group Mirror ,Join ,Scale, Editing withthe gumball actions: Gumball Controls ,Trim ,Split Extend ,Offset Array.

MODULE - III

Precision modeling:
Distance and angle constraint entry, Object Snaps, Additional modeling aids, Project constraint, View ports and construction planes, Construction planes Analysis commands- Distance, Length, Radius, Point evaluation, Drawing with precision, circles, arcs, ellipses and polygons, rectangles, free from curves, helix and spiral.

MODULE - IV

Modeling and Editing:
Creating Deformable Shapes, Modeling with Solids, Creating surfaces- Simple surfaces, Planes, Surface from planar curves, Surface from edge curves, Extruding curves, Lofted surfaces, Revolved surfaces, Rail Revolve, Sweeps and curve networks. Importing and exporting, Exporting Rhino File Information, Importing other file formats into Rhino.

MODULE – V

Annotating your model :
Dimensions, Dimension types, Dimension tools, Linear Dimensions, Leaders, Making a 2-D drawingfrom a 3-D model, Transforming solids: Flow along surface, Surface direction.
Viewing the Building Model, Managing Views, Controlling Object Visibility, Working with Section and Elevation Views , Creating and Modifying 3D Views

MODULE - VI

Rendering:
Apply materials, Add lights, Add textures Use a ground plane, Creating Renderings, Using Walk through,Using Sun and Shadow Settings.

Lumion 3D Software:
importing the model in the software, applying material to the objects , choosing the visual styles ,adjusting the backgrounds, adding objects ,animate the objects, creating views, rendering the views, setting up camera angles, exporting the video.

Text books:

1. Inside Rhinoceros 5, 4th Edition by Ron K.C. Cheng Hong Kong Polytechnic University.
2. The Big Book of Simulation Modeling: Multi-method Modeling with Any LogicKindleEdition by Andrei Borshchev.

Reference Books:

1. Building Software simulation by James J.Nutaro, Wiley publications.
2. Building Performance simulation for design and operation by Jan L.M. Hensen and RobertoLamberts, spon press publications.

BT21B7K1 SKILL ENHANCEMENT COURSE-5

SEMESTER	Course Code	Course Title	L	T	P/S/F	C	Int. Marks	Ext. Marks	Total Marks
VII	BT21B7K1	NPTEL /MOOCS/SWAYAM	0	2	0	2	100	-	100

COs	Course Outcomes	POs	BTLs
	The student will be able		
CO1	To develop management and entrepreneurship skills.	10	2

The student must learn any of the following:
NPTEL /MOOCS/SWAYAM

BT21B7C1 MECHANICAL CIRCULATION SYSTEMS

SEMESTER	Course Code	Course Title	L	T	P/S/F	C	Int. Marks	Ext. Marks	Total Marks
VII	BT21B7C1	Mechanical Circulation Systems	2	2	-	3	50	50	100

COs	Course Outcomes	POs	BTLs
	The student will be able		
CO1	To study and understand the basic means of mechanical circulationsystems, types of lifts and control systems	1,3	2,3
CO2	To study the design and dimensions of stairs, ramps and other standards ofdesign of elements inside a building for universal design for physically challenged	1,3	2,3
CO3	To study escalators with dimensions and other basic parameters related toescalators, travelators	1,3	2,3
CO4	To study the working, performance ,efficiency, flow control strategies offans and blowers besides energy conservation opportunities	1,3	2,3
CO5	To study the use of hydraulic and pneumatic actuating systems and their types with applications	1,3	2,3
CO6	To study the maintenance and the safety operations of mechanical circulationsystems categorically the lifts.	1,6	2,3

MODULE – I

Movement systems; lifts, escalators, travolators, Lifts Terminology, Design Issues, Lifts motor design. Passenger Lifts, Location of passenger lifts, Glass-walled lifts, Size and capacity of passenger lifts, Safety devices in passenger lifts, Signage for passenger lifts, Emergency systems for passenger lifts, Interior finishes in passenger lifts.
Evacuation Lifts, Vertical Platform Lifts, Retro-fitted vertical platform lifts, Location and use of vertical platform lifts, recommended dimensions for vertical platform lifts, Short-rise vertical platform lifts, Enclosed and non-enclosed vertical platform lifts, Controls for vertical platform lifts.

MODULE - II

Vertical Circulation, Internal Stairs, Design and dimensions of internal stairs, Refuges, Tactile hazard warning surfaces for stairs, Handrails for internal stairs.

Internal Ramps, Design and dimensions of internal ramps, Ramp landings, Ramp handrails and kerbed up stands. Standards as given in TSS, TCPO, CPWD, ADA etc. for physically challenged and barrier free buildings.

MODULE - III

Inclined Platform Stair lifts, recommended dimensions for inclined platform stair lifts, Stair lifts Escalators,Recommended dimensions for escalators, Escalator speeds, Travelators.

MODULE - IV

Fans and blowers: Types, Performance evaluation, efficient system operation, Flow control strategies andenergy conservation opportunities.
MODULE - V
Hydraulic and pneumatic actuating systems, Fluid systems, Hydraulic and pneumatic systems, components, control valves, electro-pneumatic, hydro-pneumatic, electro-hydraulic servo systems: Mechanical actuating systems and electrical actuating systems
MODULE – VI
Shutting down the lift, preparation, maintenance schedule, maintenance work, visual inspection, oil level, checking the spring resistance measurement" X", checking the clearance gap "**S**", checking the functionality of the limit switch, adjusting measurements "**Y**" at the limit switch, checking the electrical contacts, checking the tightening torque, checking the rope jump-off safety device, initial operation after maintenance work

Text books:

1. Building Technology Mechanical and Electrical Systems by Benjamin Stein.,Wiley, 1977.
2. Mechatronics – Principles and Application by Godfrey C. Onwubolu., Elsevier Edition.

Reference Books:

3. Elevator Mechanical Design, 3rd Edition by Lubomir Janovsky
4. Elevators, Hydraulic and Electric, A complete Handbook by Calvin F.B.

BT21B7C2 CONTRACT, TENDER AND PROCUREMENT MANAGEMENT

SEMESTER	Course Code	Course Title	L	T	P/S/F	C	Int. Marks	Ext. Marks	Total Marks
VII	BT21B7C2	Contract, Tender and Procurement Management	2	2	-	3	50	50	100

COs	Course Outcomes	POs	BTLs
	The student will be able		
CO1	To document the impact of each procurement phase on overall project goals.	1,2,11	2,3
CO2	To analyze significant issues related to qualifying and selecting suppliers/sellers or vendors for a project requirement.	2,11	2,3
CO3	To assess key factors, including risk factors that affect buyer and seller decisions concerning contract pricing and the selection of the proper contract type.	1,2,11	2,3
CO4	To compare e-procurement with other types of supplier bidding models .The student will be able	1,2,11	2,3
CO5	To summarize methods for soliciting a bid proposal, and evaluate technical,management, commercial, and ethical requirements.	1,2,11	2,3
CO6	To summarize methods for Selection of consulting firms.	2,11	2,3

MODULE – I

Integrated Materials Management:

Definition, scope, need, corporate policies, procurement cycle, overview on source selection and vendor development and Buyer – Vendor Relationship (TKG), LifoFifo, C-Form, Introduction to VAT, Service Tax & GST

MODULE - II

Purchasing Management

Price forecasting, Planning and Budgeting, Source Selection and Vendor Development, Negotiation, Supply confidence, Legalities in Procurement, Materials Handling, Transportation, Insurance and Stores Management, Inventory Management, Economic order quantity

MODULE - III

Contracts Introduction

Contracts; types of contracts such as item rate, lump-sum, cost plus percentage etc. General principles of Indian contract Act; Building contracts, conditions and forms of contract, Administration of contract. Principle of Arbitration, Indian Arbitration act 1940, Powers and duties of arbitrators, revoking authority; umpire, award cost fixed fee, cost with penalty, labour day work, piece work Daily Easement: definition; various types of easements; Dominant, and servient owners; essential conditions for enjoyment of easement. Fire insurance's definition, cover note; insurance for new work and additions; insurable value of property, claim for damage due to fire**.** Insurance of completed and pied building.

MODULE - IV

The Tender Process

Tender as a basis of contract, preparing sound tendering documents, bid invitation: E-tendering, Bid/nobid analysis, preparation and submission of bids, Tender structure for different types of contracts, General conditions of contract and special conditions of contract.

MODULE – V

Arbitration and conciliation act, Indian contract act 1872, case study by students on contract laws & claims. Breach of contract, alternate dispute resolution systems, risk management, use if FIDIC for conditions of contract – Red book, Interpretation of Contract, Rules of Interpretation.

MODULE - VI

Selection of consulting firms

Announcement and pre-qualification, short listing, Request for Proposals, Preparation and submission ofproposals, Receipt and opening of proposals, Evaluation of proposals, Selection of the consulting firm and negotiations, Agreement, Notification and Debriefing, Techno commercial evaluation.

Text books:

1. Contracting for Project Management by J. Rodney TurneR.,Gower
2. Procurement Principles & Management by Peter Baily, David Farmer, Barry Crocker, andDavid Jessop., Trans-Atlantic
3. Project Procurement Management by Stephen Guth.

Reference Books:

4. Contract Management by BS Pail
5. Procurement Management Grand by Baily & Farmer.

BT21B7E1 PROJECT FINANCE

SEMESTER	Course Code	Course Title	L	T	P/S/F	C	Int. Marks	Ext. Marks	Total Marks
VII	BT21B7E1	Project Finance	3	-	-	3	50	50	100

COs	Course Outcomes	POs	BTLs
	The student will be able		
CO1	Understand the principles of project financing and basic knowledge of Project finance.	11,12	2
CO2	To outline the key components of the Market Analysis, Business Model, Competencies & Promoter Analysis.	1,2	2
CO3	To study the key components of the estimation cost of projects.	1,2	4
CO4	To know about Financial Projections.	2,4	5
CO5	To understand project finance and Public Private Partnerships.	1,2	2
CO6	To analyse Taxation, Incentives, Project Risks & Their Mitigation.	4,11,12	4

MODULE – I

Project Finance Background: The process of developing a project from its inception to its commissioning, and the financing ofprojects. Evolution of Project Finance, Project Types, Critical Steps in a Project.

MODULE - II

Market Analysis, Business Model, Competencies & Promoter Analysis
Background, Market Sizing, Consumer, Customer and Influencer, Market Insight Areas, Market Research Approaches, Business Model, Competencies, Promoter Analysis.

MODULE - III

Estimating Cost of Project: Project Specifications, Estimating Fixed Capital Investment in Project, Estimating Working CapitalInvestment in the Project.

MODULE - IV

Financial Projections: Background, Assumptions, Cost of Project & Means of Financing, Projected Profit& Loss Account, Projected Balance Sheet, Projected Funds Flow, Project IRR, Equity IRR, Loan Servicing Capability, Sensitivity Analysis, Building Scenarios.

MODULE - V

Project Finance and Their Sources
Prudence in Mix of Long Term and Short Term Finance, Forms of Long Term Project Finance, Forms ofShort Term Project Finance, Lease, and Role of Non-Banking Finance Companies.
Public Private Partnerships
Background, PPP Models, Parties to a PPP Model, PPP Process, Model Concession Agreements.

MODULE - VI

Taxation & Incentives
Taxation, Depreciation, Amortization of Preliminary Expenses, Interest on borrowed capital, Disallowancesunder the Act, Expenses in General and Incentives.

Project Risks & Their Mitigation
Background, Project Conceptualization Risk, Financial Closure Risk, Project Construction Risk, PoliticalRisk, Market Risk, Supply Chain Risk, Policy Risk, Exchange Risk, Environmental Risk and Force Majeure.

Text books:

1. Project Financing by John D Finnerty
2. The Principles of Project Finance by Rod Morrison
3. Financial Management by Prasanna Chandra

Reference books:

1.Public Private Partnership and Project Finance by Prabuddha K. Das2.Project Finance NSE (National Stock Exchange).

BT21B7E2 HUMAN BEHAVIOR IN BUILDINGS

SEMESTER	Course Code	Course Title	L	T	P/S/F	C	Int. Marks	Ext. Marks	Total Marks
VII	BT21B7E2	Human Behavior In Buildings	3	-	-	3	50	50	100

COs	Course Outcomes	POs	BTLs
	The student will be able		
CO1	Integrate human behavior into the total investigation	1,6,8	2,3
CO2	To make the student understand about basic information of human needs in building services.	8,9	2,3
CO3	To make the student understand employee risk factors.	6,11	2,3
CO4	To make the student understand about Hospitality management.	6,8,11	2,3
CO5	To make the student understand about various Personality development Skills / Knowledge.	6,8,11	2,3
CO6	To make the student understand about different Organizational Behavior.	1,6	2,32,3

MODULE – I

Introduction:
Human needs and influence of Facilities planning on human needs. Maslow's hierarchy of needs. Environmental behavior in facilities planning. Behavior of users in different settings. Study of proxemics, claustrophobia, crowding. Intimate, personal, social and public distances. Densities and their standards. Privacy, levels of privacy, audio and visual privacy. Concepts of barrier, territoriality, security. Life style, attitudes, values and tools to measure them.

MODULE - II

Safety, security and control:
Energy control. Setting up and preparing for work. Closing Down. Effective Communication. Waste Management.

MODULE - III

Handling of Employee/ Associate Complaints. Caring For an associate / Employee. Importance of using employee related Language.

MODULE - IV

Hospitality management:
Learning objectives, Top ten Global Issues and challenges in the hospitality industry. Coping with Global Issues and trends. Hospitality Information Systems. Hotel and rooms Division Operation. Application ofFacility planning in Hospitality Services.

MODULE - V

Personality development:
Listening. Voice and Language, Telephone Etiquette, Presentation skills, E-mail Writing, Attitude Speaking, Inter Personal Communication.
Human resource development – Leadership and Motivation. Team Work and team Building, Conflict Resolution, Decision Making.

MODULE - VI

Organizational Behavior-1:

The human behavior in organizational settings. The major elements of managerial and supervisory functions in business organizations and the dynamics of human behavior in organizational settings.

Organizational Behavior-2:

Motivation, leadership, job and organizational design, creative communication, problem solving, and conflict resolution. Contemporary issues (cultural diversity, globalization, etc) to be discussed.

Text books:

1. Human Behavior in Design: Individuals, Teams, Tools by Udo Lindemann. Dimensions of Human Behavior: Person and Environment (Series in SocialWork) by Elizabeth D.Hutchison
2. Introduction to Human Factors and Ergonomics by R.S. Bridger, 4th Edition, CRC Press.

Reference Books:

1. Modelling and Simulation Human Behaviour in System Control by Pietro Carlo Cacciabue, Springerpublications
2. Environmental Psychology An Introduction by Linda Steg and Judith I.M. De Groot, 2nd Edition,Wiley Publications.

BT21B7E3 DISASTER MANAGEMENT IN BUILDING SERVICES

SEMESTER	Course Code	Course Title	L	T	P/S/F	C	Int. Marks	Ext. Marks	Total Marks
VII	BT21B7E3	Disaster Management In Building Services	3	-	-	3	50	50	100

COs	Course Outcomes	POs	BTLs
	The student will be able		
CO1	To understand the concept of hazard, identification and necessary measures to withstand it	2,7	1,7
CO2	To analyze the impact of hazards in different perspectives	2,4	4
CO3	To Assess the disaster and study their impact on infrastructure and building services	12	5
CO4	Analysis of critical facilities at the time of disaster	1,4	4
CO5	To learn pre disaster management strategy and their outcomes	1,4	2,4
CO6	To learn post disaster management strategy and necessary actions to be implemented and learning of existing laws and codes and also make a long term response plan for construction industry development for disaster prevention and response	1,4	2,4

MODULE – I

Introduction to Disaster Management

Contents Concepts of Hazard, Susceptibility to Vulnerability Reduction, The Nature of the Hazard, Rapid Onset vs. Slow Onset ,Controllable Events vs. Immutable Events, Frequency vs. Severity, Mitigation Measures to Withstand Impact vs. Mitigation Measures to Avoid Impact, The Nature of the Study Area, The Participants in the Event.

Hazard Management and Development Planning Hazard Management Activities, Disaster Mitigation, Natural Hazard Prediction, Emergency Preparedness, Disaster Rescue and Relief, Post-Disaster Rehabilitation and Reconstruction, Education and Training Activities.

MODULE - II

Identification and Prioritization Of Hazards

Natural Hazards in Perspective Historical Disasters and Agricultural Losses, Economy-wide Effects of Disasters, Natural Hazards and Development Issues, Potential Mitigation Strategies.

Potentially Hazardous Natural Phenomena Atmospheric, Seismic, Other Geologic, Hydrologic, Volcanic
Wildfire.

MODULE - III

Man-Made and Technological Types of Disasters, Hazardous materials, Power service Disruption & Blackout, Nuclear Power Plant and Nuclear Blast, Radiological Emergencies, Chemical and Weapons, Cyber, Explosion, Civil Unrest.

Assessing the Disasters and their Impact on Infrastructure and Building services might include:

- Building control systems.
- Energy distribution.
- Energy supply (gas, electricity and renewable sources such as solar, wind, Geothermal and biomass).
- Escalators and lifts.
- Facade engineering (such as building shading requirements).
- Fire safety, detection and protection.
- Heating, ventilation and air conditioning (HVAC).
- Information and communications technology (ICT) networks.
- Lighting (natural and artificial).
- Lightning protection.
- Refrigeration.
- Security and alarm systems.

Water, drainage and plumbing (including sustainable urban drainage systems (SUDS).

MODULE - IV

Critical Facilities Analysis

Public Safety And Security: Civil defence installations**,** Communications centres**,** Emergency management centres**,** Fire stations**,** Hospitals and other medical facilities**,** Mass emergency shelters**,** Police stations and other installations for public security

High-Density Occupancy: Auditoriums, theatres, stadiums, Churches, Educational facilities, Hotels, Office buildings, Penal institutions

Transportation: Airways-airports, Highways-bridges, tunnels, roadbeds Railways.

Utilities: Communications-lines, stations, printing presses, relay points, antenna complexes, Electric power- water impoundments, fuel storage, generators, transmission lines, substations, switch yards, Petrochemical installations-production, transmission, storage, terminals, Potable water-collection, transmission, siphons, flumes, treatment, storage, Waste water-collection, treatment, discharge

Agricultural: Food-storage, processing, transfer, Irrigation systems, Water containment-dams, reservoirs, levees, dikes, other impoundments Disaster Case Studies in above Scenarios.

MODULE - V

Disaster Management Strategy

Pre-Disaster Phase: Preparedness in "No Disaster Situation", Formulation of District Disaster Management Plan, Risk Assessment and Vulnerability Analysis, Resource Inventory. Allocation of responsibilities to the individual actors/Groups/Institutions/Organizations.

Impact Phase: Emergency Relief Measures, Rescue operation/Evacuation by teams (already identified) and

providing basic infrastructure and movement to rescue centres, Management of Rescue Shelters, Administration of Relief.

MODULE - VI

Post Disaster Phase: Damage Assessment and Long term relief, Assessment & enumeration of damage, Developing a Reconstruction and Rehabilitation plan, Monitoring Relief Operation organized by outsideagencies/ UN Agencies/ Red Cross/ NGOs/ PSUs/ other states etc, Restoration of Communication- Roads,Railways, Electronic Communication etc., Maintenance of Law & Order, Provision of Medical facilities, Minimum sanitation, drinking water, free kitchen etc, Removal of debris and disposal of carcasses.

Construction Industry Development For Disaster Prevention And Response

Enforcing Existing Codes and Laws, Preparedness for Disaster evacuation, Structural Mitigation Measures, Retrofitting. Earth Quake Resistant Construction. Long term response plan.

Text books:

1. Disaster Management by Dr. Mrinalini Pandey -Wiley India Pvt. Ltd.
2. Disaster Science and Management by Tushar Bhattacharya-McGraw Hill Education (India) Pvt.Ltd.
3. Disaster Management : Future Challenges and Opportunities by Jagbir Singh, K W Publishers Pvt. Ltd.
4. Disaster Management by J. P. Singhal , Laxmi Publications.
5. Biodiversity, Environment and Disaster Management by Shailesh Shukla, Shamna Hussain,Unique Publications
6. Earth and Atmospheric Disaster Management : Nature and Manmade by C. K. Rajan, Navale Pandharinath, B SPublication

Reference Books:

1. Disaster Management Guidelines. GOI-UNDP Disaster Risk Reduction Programme2009-2012.
2. Disaster Medical Systems Guidelines. Emergency Medical Services Authority, State of California,EMSA no.214, June 2003
3. Guerisse P. 2005 Basic Principles of Disaster Medical Management. Act Anaesth.Belg;56:395-401
4. Aim and Scope of Disaster Management. Study Guide prepared by Sharman and Hansen.UW-DMC,University of Washington.

SEMESTER-VIII

BT21B8TH THESIS

SEMESTER	Course Code	Course Title	L	T	P/S/F	C	Int. Marks	Ext. Marks	Total Marks
VIII	BT21B8TH	Thesis	-	-	-	18	200	200	400

COs	Course Outcomes	POs	BTLs
	The student will be able		
CO1	To demonstrate the skills and knowledge students have acquired in their studies.	1,3,6, 9,11	1,3,6

MODULE – I

Course Contents:

Each student of Bachelor of Building Technology and services is required to prepare a dissertation / project thesis on a subject concerning Building Technologies and services for a building under a guide/adviser as approved by the Head of the Department. The dissertation / project will provide opportunity to the student to synthesize the knowledge and skills acquired through the learning of various theories and practices during the course. Each student is expected to prepare a project thesis based on the preliminary work undertaken in the subject Pre Thesis Seminar of VII semester.

The project work should be mentored by the design consultant where they are undergoing practical training or any professional expert having specialized expertise in the topic chosen by the student. However incase the mentor is not available student can choose one from the university.

In case the student opts to work out of station he/she may be permitted to opt for internal faculty as guideup till the time they leave for internship. If any Reviews are scheduled in his period of internship the student can attend the review through a digital media.

At the end of the semester, each student is expected to submit the original investigation proposed design drawings prepared as per the department's specifications; three copies of the report in the specifiedformat and in a soft copy and a physical or digital / virtual model should be submitted to the department after obtaining the approval of the respective guide/ adviser.

Note: The department shall schedule the final viva- voce, at its convenience, only after the receipt of the project submission from the students.

BT21B8PT INTERNSHIP- PRACTICAL TRAINING

SEMESTER	Course Code	Course Title	L	T	P/S/F	C	Int. Marks	Ext. Marks	Total Marks
VIII	BT21B8PT	Internship	-	-	-	12	-	100	100

COs	Course Outcomes	POs	BTLs
	The student will be able		
CO1	The objective of practical training is to give the student supervised opportunities to experience the essential practical tasks emphasized in their professional study and also to provide opportunities to apply their acquired skills and knowledge in working life.	4,9,1 ,12	3,4,5,6

MODULE – I

Every student must work in an Office as a full-time trainee for a period of 8 calendar weeks (excluding Viva-voce) from the date of commencement of training. The Chief in the firm should have a minimum of Viva-voce) from the date of commencement of training. The Chief in the firm should have a minimum of five years of practical/professional experience as Building services consultant after her/his graduation. The student should involve herself/himself in various aspects of work in an office like design of MEP services, working drawings for facilities and services, quantity estimation, site supervision, etc. Detailed instructions regarding the training, the frequency of reporting to the department, etc. will be issued at the end of the seventh Semester, which the student must strictly follow.

After completion of training, every student will have to submit a detailed report with a set of drawings on at least two projects on which she/he has worked during the eight weeks of the practical training period. This report will be evaluated at a viva-voce by a jury consisting of one external, one internal and Head of the Department or his nominee. After submission of the report the department at its convenience will arrange for the conduct of the viva-voce examination.