



**Shri Vaishnav Vidyapeeth Vishwavidyalaya, Indore**  
**Shri Vaishnav Institute of Technology and Science**  
**Choice Based Credit System (CBCS) in Light of NEP-2020**  
**B.Tech. in Civil Engineering**  
**(2023-2027)**

(2023-2027)											
COURSE CODE	CATEGORY	COURSE NAME	TEACHING & EVALUATION SCHEME								
			THEORY			PRACTICAL		L	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
BTCE601N	DCC	Water Resources Engineering	60	20	20	0	0	3	0	0	3

**Legends:** L - Lecture; T - Tutorial/Teacher Guided Student Activity; P - Practical; C - Credit;

\*Teacher Assessment shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

**Course Educational Objectives (CEOs):**

To impart the knowledge for understanding elementary aspects of hydrology and Fluid Hydraulics for use in the planning, design, and management of water resources projects. Also to impart understanding of introductory aspects of integrated water resources development and management.

**Course Outcomes (COs):**

Student will be able to

1. Understand hydrologic data observation, processing, and analysis.
2. Learn methods of flood estimation and flood routing
3. Understand ground water development and utilization.
4. Learn soil, water, crop relationship and irrigation requirement.
5. Learn canal design procedure and familiarization with various hydraulic structures.

**Syllabus:**

**UNIT I**

**9 Hrs.**

**Hydrology:** Hydrological cycle; Precipitation and its measurement; Rain gauge networks; Estimating missing rainfall data, mean depth of precipitation over a drainage area; Mass rainfall curves, in-tensity-duration curves and depth-area duration curves; Infiltration and infiltration indices; Evaporation and its measurement.

**UNIT II**

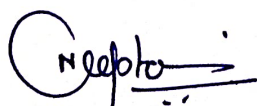
**8 Hrs.**

**Runoff and Floods:** Stream gauging; Run off and its estimation; Unit hydrograph derivation and application, S-curve hydrograph, synthetic unit hydrograph, Types of floods and methods of estimation; Flood routing through reservoirs and channels; Flood control measures; Economics of flood control.

**UNIT III**

**9 Hrs.**

**Ground Water and Well Irrigation:** Aquifer properties, hydraulics of wells under steady flow conditions; Ground water recharge-necessity and methods of improving ground water storage; Types of well, specific capacity and specific yield; Advantages and disadvantages of well irrigation.



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BTCE602N	DCC	Structural Analysis - II	60	20	20	30	20	3	1	0	4

**Legends:** L - Lecture; T - Tutorial/Teacher Guided Student Activity; P - Practical; C - Credit;

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**Course Educational Objectives (CEOs):**

1. To enable the student to have a good grasp of all the fundamental issues in these advanced topics in structural analysis.
2. To introduce the students to concept of structural stability and advanced methods in structural analysis.

**Course Outcomes (COs):**

Student will be able to

1. Analyze determinate and indeterminate structure with side sway.
2. Apply flexibility matrix to analyze any structure related to civil engineering works.
3. Apply stiffness matrix to analyze any structure related to civil engineering works.
4. Fundamentals of plastic analysis and use the same in practical applications.

**Syllabus:**

**UNIT I**

**8 Hrs.**

**Sway Analysis:** Moment Distribution method in analysis of frames with sway; Analysis of box frames; Analysis of portals with inclined members; Analysis of beams and frames by Kani's Method.

**UNIT II**

**9 Hrs.**

**Approximate Methods for Lateral Loads:** Analysis of tall frames, wind and earthquake loads; Codal provisions for lateral loads; Approximate analysis of multistoried frames for vertical and lateral loads.

**UNIT III**

**8 Hrs.**

**Matrix Analysis (Flexibility Matrix):** Introduction; Basic Concepts (Axis and Coordinates); Evaluation of flexibility matrix; Analysis of continuous beams using system approach.

**UNIT IV**

**8 Hrs.**

**Matrix Analysis (Stiffness Method):** Introduction; Basic Concepts (Axis and Coordinates); Evaluation of stiffness matrix; Analysis of Continuous Beams using system approach.

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**UNIT IV**

**9 Hrs.**

**Irrigation Water Requirement and Soil-Water-Crop Relationship:** Irrigation, necessity, irrigation development in India; Soils, suitability, wilting coefficient and field capacity; Consumptive use and its determination; Irrigation methods; Duty of water, factors affecting duty; Crops and crop seasons, principal crops and their water requirement, crop ratio and crop rotation, intensity of irrigation.

**UNIT V**

**8 Hrs.**

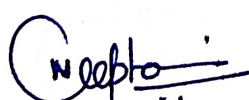
**Canals and Structures:** Types of canals; Canal alignment, Kennedy's and Lacey's silt theories, typical canal sections; Canal losses, lining-objectives, materials used, economics; Introduction to hydraulic structures viz. dams, spillways, weirs, barrages, canal regulation structures.

**Text Books:**

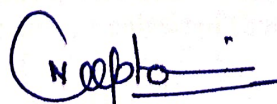
1. Irrigation & Waterpower Engineering – B. C. Punmia & B. B. Lal, Laxmi Publications, 2021 (Revised Edition).
2. Water Resources Engineering: Irrigation Engineering & Hydraulic Structures (Vol. 2) – Santosh Kumar Garg, Khanna Publishers, 2020.
3. Engineering Hydrology – K. Subramanya, Tata McGraw-Hill Education Pvt. Ltd., 2024.

**Reference Books:**

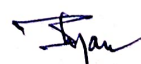
1. Water Resources Engineering – Ray K. Linsley (3rd Revised Edition). Tata McGraw Hill.
2. Hydrology and Water Resources Engineering (Vol. 1) – Santosh Kumar. Khanna Publishers.



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#### UNIT V

9 Hrs.

**Plastic Analysis:** Introduction; Shape factor, load factor, Plastic hinge, Plastic analysis of beams and frames.

#### Text Books:

1. Theory of Structures – S. Ramamrutham, Dhanpat Rai Publishing Company Private Limited, New Delhi, 2023.
2. Basic Structural Analysis – C. S. Reddy, Tata McGraw Hill Publishing Company, New Delhi, 2017.
3. Structural Analysis – V. Thandavamoorthy, Oxford University Press, 2020.

#### Reference Books:

1. Structural Analysis: A Unified Classical and Matrix Approach – A. Ghali & M. Neville, Chapman and Hall, New York, 2017.
2. Intermediate Structural Analysis – C. K. Wang, McGraw Hill, New York, 2017.
3. Indeterminate Structural Analysis – S. J. Kinney, Addison-Wesley.

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BTCE603N	DCC	Geotechnical Engineering - II	60	20	20	30	20	3	0	2	4

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**Course Educational Objectives (CEOs):**

The objective of this course is to provide the students necessary geotechnical engineering skills to analyze and design shallow and deep foundation systems under different loading and soil conditions.

**Course Outcomes (COs):**

Students will be able to

1. Understand the different types of foundation and suitable foundation system for a structure.
2. Understand about various analysis and design of foundations.
3. Identify and assess ground conditions and suggest method of improvement.

**Syllabus**

**UNIT I**

**9 Hrs.**

**Shallow Foundations and Bearing capacity:** Type of foundations shallow and deep; Bearing capacity of foundation on cohesion less and cohesive soils; General and local shear failures; Factors effecting bearing capacity of soil; Theories of bearing capacity - Prandtl, Terzaghi's, Skempton, Meyerhof and Hansan; Indian standard code for bearing capacity; Limits of total and differential settlements; Plate load test.

**UNIT II**

**9 Hrs.**

**Deep Foundation and Estimation of capacity piles foundation:** Pile foundation-introduction, types of piles; Estimation of individual and group capacity of piles in cohesion less and cohesive soils; Static and dynamic formulae; Pile load test, settlement of pile group; Negative skin friction; Well foundation. Equilibrium of wells; Analysis for stability for tilts and shifts, remedial measures.

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### UNIT III

**9 Hrs.**

**Soil Improvement Techniques:** Compaction, factors affecting compaction, properties of soil affected by compaction; Field and laboratory methods; Proctor compaction tests; Equipment for field compaction and their suitability. **Soil Stabilization:** Mechanical, lime, cement, bitumen, chemical, thermal, electrical stabilization, and stabilization by grouting; Geo-synthetics, types, functions, materials and uses; Introduction to Stone Columns methods

### UNIT IV

**8 Hrs.**

**Soil Exploration and Deep Excavation:** Soil exploration, methods of soil exploration; Planning of exploration programme for buildings, highways, and earthen dams; Disturbed and undisturbed samples and samplers; Basics of Deep Excavation, Excavation Support Systems, Construction Techniques and Equipment, Groundwater Control in Excavation

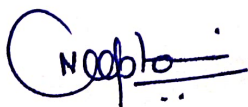
### UNIT V

**8 Hrs.**

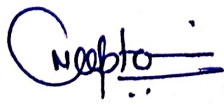
**Machine foundation and Soil Structure Interaction:** Modes of vibration; Mass-spring analogy; Natural frequency; Effect of vibration on soils; Vibration isolation; Design criteria for impact type of machine; Introduction to Soil Structure Interaction and its effects.

### Text Books:

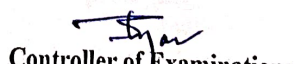
1. Soil Mechanics and Foundation Engineering – Dr. K. R. Arora, Standard Publishers, Delhi, 2020.
2. Soil Mechanics and Foundation Engineering – Dr. B. C. Punmia, Laxmi Publications, Delhi, 2017.
3. Geotechnical Engineering – C. Venkatramaiah, New Age International Publishers, Delhi, 2018.

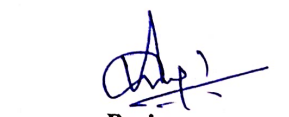


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BTCE603N	DCC	Geotechnical Engineering - II	60	20	20	30	20	3	0	2	4

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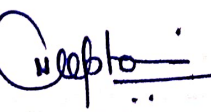
**References:**

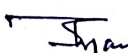
1. Soil Mechanics and Foundation Engineering – S. K. Garg. Khanna Publishers, Delhi.
2. Basic and applied soil mechanics – Ranjan, G., & Rao, A. S. R., New Age International Publishers, Delhi, 2005.


**List of Experiments.**

1. Determination of the natural content of the given soil sample.
2. Indian Standard Light Compaction Test/Std. Proctor Test
3. Indian Standard Heavy Compaction Test/Modified Proctor Test
4. Determination of unconfined compressive strength using Unconfined Compression Test
5. Determination of Shear Strength Parameters for Triaxial Compression Test
6. Determination of Shear Strength using laboratory Vane shear test
7. Determination of bearing capacity of soil sample using California Bearing Test(CBR Test)
8. Study of Plate Load Test SPT & DCPT

  
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BTCE604N	DCC	Design of Steel Structures	60	20	20	30	20	3	0	2	4

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**Course Educational Objectives (CEOs):**

Student will be able to analyze structure for various loads and will be able to design different structural systems, as per provisions of latest IS: 800:2007.

**Course Outcomes (COs):**

Students will be able to

1. Analyze various loads and design bolted and welded connections.
2. Design compression and tension member.
3. Design different types of beams and girders.
4. Design structures trusses and industrial frames.

**Syllabus**

**UNIT I**

**8 Hrs.**

**Connections:** Properties of steel; Structural steel sections; Limit State Design Concepts; Loads on structures; Design of structural connections-Bolted and Welded connections; Eccentric connections.

**UNIT II**

**9 Hrs.**

**Tension Members:** Design of tension members and its connections; Use of lug angles; Concept of shear lag; Concept of splices and gusset plate.

**UNIT III**

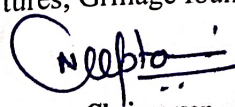
**8 Hrs.**

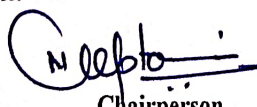
**Beams:** Design of simple beams; Concept of web buckling and web crippling; Concept of laterally supported and laterally unsupported; Built-up beams; Design of plate girders.

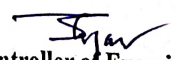
**UNIT IV**


**8 Hrs.**

**Compression Members:** Design of single section and compound section of compression members; Design of Column; Design of laced and battened type columns; Design of footings for steel structures; Grillage foundation.

  
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BTCE604N	DCC	Design of Steel Structures	60	20	20	30	20	3	0	2	4

Legends: L - Lecture; T - Test; P - Project

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### UNIT V

**9 Hrs.**

**Trusses and Industrial Frames:** Roof and side coverings; Design of purlin and elements of truss; Design of industrial building frames and multistory frames,

### Textbooks:

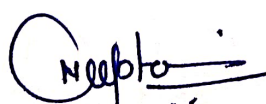
1. Limit State Design of Steel Structures – N. Subramanian, Oxford University Press, 2011.
2. Design of Steel Structures – L. S. Negi, Tata McGraw-Hill Publishing Company.
3. Limit State Design of Steel Structures – S. K. Duggal, McGraw Hill, 2021.

### References:

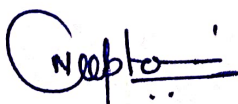
1. Design and Analysis of Steel Structures – V. N. Vazirani & M. M. Ratwani, Khanna Publishers.
2. Design of Steel Structures – S. S. Bhavikatti, I.K. International Publishing House Pvt. Limited, 2014.
3. Comprehensive Design of Steel Structures – B. C. Punmia, Laxmi Publications, 2015.

### List of Experiments.

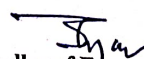
1. Detailed drawing of bolted and welded connection.
2. Design of tension members.
3. Design of simple and compound beams.
4. Design of plate girder.
5. Design of simple and built-up compound column with lacing and battens.
6. Design of various types of steel footings ex. slab base, gusseted base, grillage footing.




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BTCE702N	DCC	Estimation and Costing	60	20	20	0	0	2	1	0	3

**Legends:** L - Lecture; T - Tutorial/Teacher Guided Student Activity; P - Practical; C - Credit;

\*Teacher Assessment shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

**Course Educational Objectives (CEOs):**

1. To inculcate the essentials of Civil Engineering field to the students of all branches of Engineering.
2. To provide the students knowledge regarding estimation of quantities involved in Civil Engineering works.

**Course Outcomes (COs):**

Students will be able to

1. Prepare rough and detailed estimate of buildings for different items.
2. Gain knowledge of specifications of different items of building.
3. Perform rate analysis of different work items.
4. Understand contracts, accounts and arbitration.

**Syllabus**

**UNIT I**

**8 Hrs.**

**Introduction:** Purpose and importance of estimates; Principles of estimating; Types of estimates, plinth area rate, cubical content rate, preliminary, original, revised, and supplementary estimates, measurement sheet and abstract sheet.

**UNIT II**

**8 Hrs.**

**Analysis of rates:** Various factors involved in the rate of an item, material and labour requirement for various trades; Preparation for rates of important items of work brick work, plain cement concrete and plastering; Bill of quantities (B.O.Q.); Schedule of rates. (S.O.R.)

**UNIT III**

**9 Hrs.**

**Detailed Estimates:** Preparing detailed estimates of various types of buildings using long wall-short wall method and centre line method; Calculation for R.C.C. works for structural members like beam, column and slab; Bar bending schedule (B.B.S.)

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			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
BTCE702N	DCC	Estimation and Costing	60	20	20	0	0	2	1	0	3

**Legends:** L - Lecture; T - Tutorial/Teacher Guided Student Activity; P - Practical; C - Credit;

**\*Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

#### UNIT IV

**8 Hrs.**

**Specifications:** Necessity of specification, types of specifications.

**Contracts:** Essentials of contracts, types of engineering contracts – advantages and disadvantages

**Tenders:** Tender forms, tender documents, and notices – time limits, necessity, E Tendering.

#### UNIT V

**9 Hrs.**

**Cost of Works:** Factors affecting cost of work, overhead charges; Contingencies and work charge establishment; Preparation of DPR.

**Valuation:** Purposes, depreciation, sinking fund, scrap value, year's purchase, gross and net income, dual rate interest; Methods of valuation; Rent fixation of buildings.

#### Text Books:

1. Estimation and Quantity Surveying – B. N. Dutta, UBS Publishers Distributors Pvt. Ltd., 2016 (28th Revised Edition).
2. A Text Book of Estimating and Costing for Civil Engineering – G. S. Birdie, Dhanpat Rai Publishing Company Private Limited, New Delhi, 2014 (6th Edition).
3. Estimating, Costing and Valuation – S. C. Rangwala, Charotar Books Dist., Anand, 2017.

#### References:

1. Civil Engineering Estimating, Costing & Valuation – V. N. Vazirani & S. P. Chandola, Khanna Publishers, 2010.
2. Estimating, Costing, Specification & Valuation in Civil Engineering – M. Chakraborti, 2006 (29th Revised & Enlarged Edition).
3. CPWD Specifications, Central Public Works Department.

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			THEORY			PRACTICAL		L	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers As- sessment*	END SEM University Exam	Teachers As- sessment*				
BTCE605N (1)	DSE	Traffic Engineering	60	20	20	30	20	2	0	2	3

**Legends:** L - Lecture; T - Tutorial/Teacher Guided Student Activity; P – Practical; C - Credit;

**\*Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

**Course Educational Objectives (CEOs):**

The aim of this course is to teach students about the traffic characteristic, traffic studies, intelligent transportation system and accidental studies in traffic engineering.

**Course Outcomes (COs):**

Student will be able to

1. Understand the traffic characteristics.
2. Perceive the knowledge about different studies involved in traffic engineering.
3. Get knowledge about component intelligent transport system.
4. Get knowledge about accident studies and mass transportation.

**Syllabus**

**UNIT I**

**6 Hrs.**

**Traffic Characteristics:** Road user's characteristics; Physical, mental and emotional factors; Factors affecting reaction time, PIEV theory; Vehicular characteristics- Characteristics affecting road design-width, height, length and other dimensions; Weight, power, speed; Braking capacity of a vehicle.

**UNIT II**

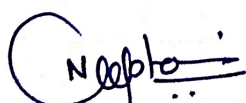
**6 Hrs.**

**Traffic Studies:** Spot Speed Studies and Volume Studies; Speed and Delay Studies; Origin and destination Studies (O & D), Various methods, collection and interpretation of data, planning and sampling; Traffic Capacity Studies- volume, density, capacity and level of service; Parking Studies-methods of parking studies cordon counts, space inventories, parking practices.

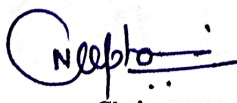
**UNIT III**

**7 Hrs.**

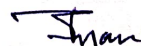
**Introduction to Intelligent Transportation Systems (ITS) :** Definition of ITS and Identification of ITS objectives; Historical background; Benefits of ITS - ITS data collection techniques – detectors, Automatic Vehicle Location (AVL), Automatic Vehicle Identification (AVI); Geographic Information Systems (GIS); Video data collection.



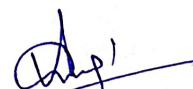
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COURSE CODE	CATEGORY	COURSE NAME	TEACHING & EVALUATION SCHEME								
			THEORY			PRACTICAL		L	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers As- sessment*	END SEM University Exam	Teachers As- sessment*				
BTCE605N (1)	DSE	Traffic Engineering	60	20	20	30	20	2	0	2	3

Legends: L - Lecture; T - Tutorial/Teacher Guided Student Activity; P - Practical; C - Credit;

\*Teacher Assessment shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

**UNIT IV**

**7 Hrs.**

**Traffic Operations and Control:** Traffic regulations and various means of control; One way streets- advantages and limitations; Traffic signals- isolated signals, coordinated signals, simultaneous, alternate, flexible and progressive signal systems; Types of traffic signals, fixed time signals, traffic actuated signals, speed control signals, pedestrian signals, flashing signals, clearance interval; problems on single isolated traffic signal.

**UNIT V**

**7 Hrs.**

**Accident Studies and Mass Transportation:**

(A) Accident Studies: causes of accidents; Accident studies and records; Condition and collision diagram, Preventive measures, modern methods of road safety

(B) Expressways, freeways and metro rail; Problems on mass transportation and remedial measures; Brief study of mass transportation available in the country

**Text Books:**

1. Principles of Transportation Engineering – Partha Chakraborty & Animesh Das, PHI Learning, 2017 (2nd Edition).
2. Traffic Engineering and Transportation Planning – L. R. Kadiyali, Khanna Publishers, 2011 (9th Edition).

**References:**

1. Guidelines on Design and Installation of Road Traffic Signals – IRC:93 – Indian Roads Congress, New Delhi, 1985.
2. Highway Capacity Manual – Transportation Research Board, Washington, DC, 2010.
3. Indian Highway Capacity Manual (INDO-HCM) – Satish Chandra, S. Gangopadhyay, S. Velmurugan & Kayitha Ravinder, CSIR-CRRI, 2017.

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BTCE605N (1)	DSE	Traffic Engineering	60	20	20	30	20	2	0	2	3

Legends: L - Lecture; T - Tutorial/Teacher Guided Student Activity; P - Practical; C - Credit;

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**List of Experiments.**

1. Study of Road user characteristics
2. Study of Traffic volume
3. Study of Intersection volume
4. Study of Small-network volume
5. Study of Origin-Destination (OD) Volume
6. Study of traffic speed
7. Speed & delay studies
8. Travel-time studies
9. Accident studies

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COURSE CODE	CATEGORY	COURSE NAME	TEACHING & EVALUATION SCHEME								
			THEORY			PRACTICAL		L	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers As- sessment*	END SEM University Exam	Teachers As- sessment*				
BTCE605N (2)	DSE	Air and Noise Pollution	60	20	20	30	20	2	0	2	3

**Legends:** L - Lecture; T - Tutorial/Teacher Guided Student Activity; P - Practical; C - Credit;

\*Teacher Assessment shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

**Course Educational Objectives (CEOs):**

1. To provide a comprehensive overview of air and noise quality.
2. To understand the science and technology associated with the monitoring and control.

**Course Outcomes (COs):**

Students will be able

1. To acquire knowledge and understanding to evaluate air quality management and analyze the causes and effects of air pollution.
2. To identify the sources of air and noise pollution.
3. To understand the concepts involved in control technologies.

**Syllabus**

**UNIT I**

**5 Hrs.**

Air pollution problem: Economics and social aspects; Historical episodes of air pollution; Sources of air pollution; Effects of air pollution on health, animal, plants, and materials.

**UNIT II**

**6 Hrs.**

Role of meteorological condition; Properties of typical air pollutants; Air diffusion and Concentration of pollutants; General diseases caused by air pollutants; Toxicity of various pollutants; Plume patterns and height of chimneys; Atmospheric chemistry and formation of secondary pollutants.

**UNIT III**

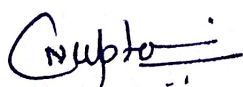
**6 Hrs.**

Sampling and Analyzing of Air Pollutants: Instrumental sampling of pollution; Standards of Air Pollution; Principle of air pollution control; Site selection and zoning; Introduction to various control methods, process, and equipment.

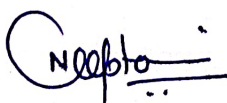
**UNIT IV**

**7 Hrs.**

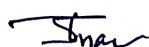
Air pollution control legislation; Public education; Status of air pollution control in various countries; Industrial Hygiene: Concept and importance; Factory involved in environmental hazards; Industrial ventilation occupational diseases; Control methods.



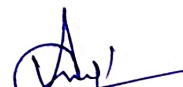
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			END SEM University Exam	Two Term Exam	Teachers As- sessment*	END SEM University Exam	Teachers As- sessment*				
BTCE605N (2)	DSE	Air and Noise Pollution	60	20	20	30	20	2	0	2	3

Legends: L - Lecture; T - Tutorial/Teacher Guided Student Activity; P - Practical; C - Credit;

\*Teacher Assessment shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

### UNIT V

**6 Hrs.**

**Basics of acoustics and specification of sound;** Sound power, sound intensity and sound pressure levels; Plane, point, line and multiple sources; Outdoor and indoor noise propagation; Psychoacoustics and noise criteria, effects of noise on health, Noise standards and limit values; Noise instrumentation and monitoring procedure.

### Text Books:

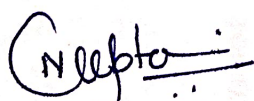
1. Fundamentals of Air Pollution – Raju, B. S. N. (2018). Oxford & IBH Publishing Co. Pvt. Ltd.
2. Air Pollution – M. N. Rao & H. V. N. Rao. Tata McGraw Hill

### References:

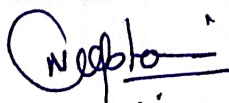
1. Air Pollution – Faith, W. L. John Wiley & Sons.
2. Air Pollution – McCabe, L. C. McGraw Hill, International.
3. Air Pollution – Stern, A. C. Academic Press, New York.

### List of Experiments.

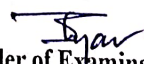
1. To study about the Ambient Air Quality standards.
2. To study the Air Sampling techniques.
3. To study about the Low and High-volume samplers.
4. To study the particulate pollution on roads using digital equipment.
5. To study the Indoor Air Quality (IAQ) and its monitoring.
6. Sampling of respirable particulate matter in the ambient and indoor environment.
7. To measure the ambient concentrations of particulate matter by using High Volume Sampler (HVS)

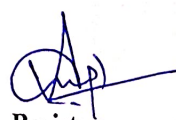


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