CET402	QUANTITY SURVEYING AND VALUATION	CATEGORY	L	T	P	CREDIT	YEAR OF INTRODUCTION
		PCC	3	0	0	2	2019

Preamble: The course provides the knowledge about various types of estimation and specification of different civil engineering works. It equips students to analyze the rate of various items of work with reference to the standard data and schedule of rate. This course develops capability of students to prepare the detailed estimate of various items of work related to civil engineering construction and also preparation of the valuation of land and buildings.

Prerequisite: Building drawing

Course Outcomes: After the completion of the course the student will be able to

Course Outcome	Description of Course Outcome	Prescribed learning level
CO1	Define basic terms related to estimation, quantity surveying and contract document	Remembering
CO2	Interpret the item of work from drawings and explain its general specification and unit of measurement.	Understanding
CO3	Make use of given data from CPWD DAR/DSR for calculating the unit rate of different items of work associated with building construction	Applying
CO4	Develop detailed measurement (including BBS) and BoQ of a various work like buildings, earthwork for road, sanitary and water supply work	Applying
CO5	Explain various basic terms related to valuation of land and building	Understanding
CO6	Develop valuation of buildings using different methods of valuation.	Applying

Mapping of course outcomes with program outcomes (Minimum requirement)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	-	-	-	-	-	-	-	-	-	-	-
CO2	2	-	-	-	-	-	-	-	-	-	-	-
CO3	3	2	-	-	-	-	-	-	-	-	-	-
CO4	3	2	-	-	-	-	-	-	-	-	-	-
CO5	2	2	-	-	-	-	-	-	-	-	-	-
CO6	3	2	-	-	-	-	-	-	-	-	-	-

Assessment Pattern

Bloom's Category	Continuous Assessment Tests		End Semester Examination
	1	2	
Remember	10		10
Understand	10	10	30
Apply	30	40	60
Analyse			
Evaluate			
Create			

Mark distribution

Total Marks	CIE	ESE	ESE Duration
150	50	100	3 hours

Continuous Internal Evaluation Pattern:

Attendance : 10marks
Continuous Assessment Test(2numbers) : 25 marks
Assignment/Quiz/Course project : 15marks

End Semester Examination Pattern: There will be two parts; Part A and Part B.

Part A contain 3 questions from Module-I & II. Answer any 2 question, each question caries 10 marks.

Part B contains 3 questions from Module III of which student should answer any 2 questions. Each full question carries 25 marks.

Part C contains 3 questions from Module IV of which student should answer any 2 questions. Each question carries 15 marks.

Note:
For analysis of rate and cost estimation, unit rate and labour requirement should be given along with the questions in the question paper. No other charts, tables, codes are permitted in the Examination Hall. If necessary, relevant data shall be given along with the question paper.

Sample Course Level Assessment Questions

CO1: Define basic terms related to estimation, quantity surveying and contract document

1.	What is mean by the term (a) Work charge establishment (b) Provisional quantity
2.	List different type of estimate. Explain any two in detail.

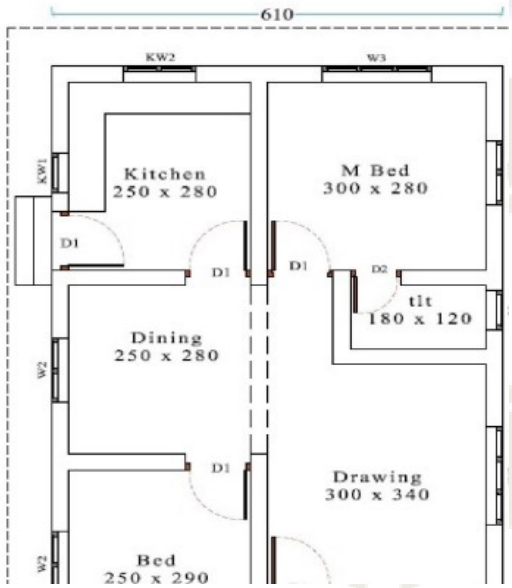
CO2: Interpret the item of work from drawings and explain its general specification and unit of measurement.

1	Give the units of following work (a) Carpentry fitting (b) Pointing (c) Plastering
2	Explain the general rule of measurement as per Indian Standards

CO3: Make use of given data from CPWD DAR/DSR for calculating the unit rate of different items of work associated with building construction

1.	Develop rate analysis for DSR item No.5.3, Reinforced cement concrete work with 1:1.5:3 (3 graded stone aggregate 20 mm nominal size) in beams, suspended floors, roofs having slope up to 15° landings, above plinth level up to floor five level, excluding the cost of centering, shuttering, finishing and reinforcement. **Material** : 20mm Aggregate 0.57m^3@₹1300/m^3, 10mm 0.28m^3@ ₹1300/m^3, coarse sand (Zone III) 0.425m^3@₹1200/m^3, Portland cement 400kg@₹5700/tonne. **Labour :** Mason 0.24@₹467/day, Beldar 2.75@₹368/day, Bhisti 0.90@₹407/day, Coolie 1.88@₹368/day **Carriage provisions** : Stone aggregate below 40mm 0.85m^3@₹103.77 , Portland cement 0.40tonne@₹5700/tonne. **Hire Charges** for concrete mixer 0.08@₹800/day, Vibrator needle type ₹0.08@350/day **Sundries** (LS) 14.30@₹1.73. Adopt water charges, contractor profit and overheads as per the CPWD DSR2018 provisions.

CO4: Develop detailed measurement (including BBS) and BoQ of a various work like buildings, earthwork for road, sanitary and water supply work

1.	List the any four items of work in plumbing work of residential building
2.	Write the unit of measurement of (i) Carpentry fittings (ii) Pointing of Brick Wall
3.	Prepare a bar bending schedule and quantities of RCC and reinforcement of a simply supported beam of length 6.5 m , depth 50 cm, and width 30 cm reinforced with 3 Nos of 20 mm dia at bottom as straight bar, 2 Nos of 20 mm dia cranked at 45o , 2 Nos 16 Φ at top of beam and 8 mm Φ 2 legged stirrups @ 15 cm c/c
4.	Prepare detailed measurement for the following items of work for the construction of residential building shown below using Centre line method (a) RRM for foundation (75cm x 75cm) and basement50cm x 50cm , Wall thickness 20cm (b) Brick work for superstructure (c) RCC works for slab (12cm thick), lintel (15cm thick), and sun shade (60cm projection) (d) Painting for walls, doors(D1-100x210; D2 80x210) and windows (W2-100x150; W3-150x150;KW1-50x100;KW2-100x100); V(90x60).  Also Calculate No. of brick, cement & sand required for Brick wall

CO5: Explain various basic terms related to valuation of land and building

1.	Explain how depreciation in building is worked out.

2.	Discuss about the different types of values and the term obsolescence
3	Discuss the importance of valuation in civil engineering.
4	Differentiate the terms Value, Cost and Price

CO6: Develop valuation of buildings using different methods of valuation.

1.	A building is situated by the side of a main road of Mumbai city on a land of 500sq m. The built up portion is 20m x 15 m.The building is first class type and provided with water supply, sanitary and electrical fittings, and the age of the building is 30 years. Workout the valuation of the property.
2.	Workout the valuation of a commercial building with the following data: Cost of land for life-time period of building is ₹.5,20,000/-. Gross income per year is ₹.8,50,000/-Expenses required per year: (a) staff salary, electric charges, municipal taxes including licenses fees, stationery and printing etc. is 20% of the gross income. (b) For repair and maintenance of lift, furniture etc. @ 5% of their capital cost of ₹.10,50,000/- (c) sinking fund for the items considered in capital cost, whose life is 25years @4% after allowing 10% scrap value. (d) Insurance premium is ₹.25,000/- per year. Take year's purchase @8% and annual repair of the building @2% on gross income.

Syllabus

MODULE 1.

Introduction- Quantity Surveying- Basic principles, Role/responsibility of Quantity surveyor at various stages of construction

Estimate-Details required, Type of estimate, purposes.

Contingencies, Work-charge establishment, Tools and Plant, centage charge, Day work, Prime cost, Provisional sum & provisional Quantity, Overhead charges, Cost index, Contract documents (Brief description only)

Bill of Quantity -Typical format-use

Item of works- Identify various item of work from the drawings-units of measurement of various materials and works (focus may give to RCC residential building)

General rule & method of measurement with reference to Indian Standard Specifications-IS1200.

MODULE 2.

Introduction to the use of CPWD schedule of rates as per latest DSR and Analysis of rate as per latest DAR

Specifications-General specification of all items of a residential building.

Detailed specification (CPWD specifications) of major item of work like Earth work excavation in foundation, masonry, Reinforced cement concrete, finishing of building work

Analysis of rates for Earth work in excavation for foundation, mortars, reinforced cement concrete Works, finishing work, masonry work, stone works, flooring with reference to latest DSR and latest DAR (Data should be given).

MODULE 3.

Detailed Estimate- Preparation of detailed measurement using Centre line method & Short wall long wall (separate wall) method for RCC single storied building (Flat roof) including stair cabin- Residential/office/school building.

BOQ preparation of a single storied RCC building work.

Material quantity calculation of the items of work (Rubble, Brick work, Concrete work, Plastering) in detailed estimate prepared for building work. (Data for unit quantity should be provided from DAR)

Bar Bending Schedule- Preparation of BBS of RCC beams, slabs, Column footings, Retaining wall.

Road estimation-Estimation of earthwork from longitudinal section-metaled road.

Estimation of sanitary and water supply work -Water tank, Septic tank, Manhole *(No Detailed estimate needed-concept of item of work, its general specification and unit of measurement*).

MODULE 4.

Valuation – purpose, factor affecting, introduction to terms-Value, Cost, Price, kinds of values Income- Gross income, net income, outgoings, annuity, sinking fund, Year's purchase, Depreciation, obsolescence -Free hold and leasehold properties.

Methods of calculating depreciation – straight line method – constant percentage method, sinking fund method and quantity survey method.

Methods of valuation– rental method, direct comparison of capital cost, valuation based on profit, depreciation method.

Various method of valuation of land (Brief description only)

Text Books:

1. B. N. Dutta, Estimation and costing in civil engineering, UBS publishers
2. Rangwala, Estimation Costing and Valuation,Charotar publishing house pvt. ltd
3. Dr. S. Seetha Raman, M.Chinna swami, Estimation and quantity surveying, Anuradha publications Chennai.
4. M Chakraborthy, Estimating, Costing, Specification and valuation, published by the author, 21 B, Babanda Road, Calcutta 26

References:

1. B S Patil, Civil Engineering contracts and estimates, university press
2. V N Vazirani& S P Chandola, Civil Engineering Estimation and Costing, Khanna Publishers
3. IS 1200-1968; Methods of measurement of building & civil engineering works
4. CPWD DAR 2018 and DSR 2018 or latest
5. CPWD Specifications Vol1 & 2 (2019 or latest edition)

Course Contents and Lecture Schedule

Module	Topic	Course Outcomes addressed	No. of Lectures
1	**Module I: Total lecture hours:8**		
1.1	Introduction to Quantity survey, basic principle, Role/responsibility of Quantity surveyor, Estimate-List the types, Details required	CO1	1
1.2	Types of estimates, simple problems of approximate estimate, purpose	CO1	1
1.3	Contingencies, Work-charge establishment, Tools and Plant, centage charge, Day work, Prime cost, Provisional sum & provisional Quantity (Brief description only)	CO1	1
1.4	Bill of Quantity -Typical format-use	CO2	1

1.5	Units of measurement of various materials and works	CO2	2
1.6	General rule & method of measurement with reference to Indian Standard Specifications-IS1200	CO2	1
1.7	Introduction to the use of CPWD schedule of rates as per latest DSR and Analysis of rate as per latest DAR, Overhead charges, Cost index.	CO2	1
2	**Module II: Total lecture hours-5**		
2.1	Specifications-General specification of various items of building work.	CO3	1
2.2	Detailed specification of major item of work like Earth work excavation in foundation, masonry, Reinforced cement concrete, finishing of building work with reference to CPWD specifications	CO3	2
2.3	Analysis of rates for Earth work in excavation for foundation, mortars, reinforced cement concrete Works, finishing work, masonry work, stone works, flooring with reference to latest DSR and latest DAR (All data (Material, labour & machine) and rate will be given in the question paper)	CO3	2
3	**Module III: Total lecture hours: 16**		
3.1	Preparation of detailed measurement and abstract of estimate using Centre line method & Short wall long wall (separate wall) method- Explain with a single room building example	CO4	2
3.2	Preparation of detailed measurement for RCC single storey buildings with stair cabin- Excavation for foundation, Foundation and basement, DPC, Masonry in superstructure, RCC, Plastering, Painting, flooring, Woodwork, Staircase.	CO4	5
3.3	Preparation of BoQ of single storied RCC building	CO4	1
3.4	Material quantity calculation of the Rubble, Brick work, Concrete work, plastering in detailed	CO4	1

	estimate of RCC building (Data for unit quantity should be provided from DAR)		
3.5	BBS of RCC beams, slabs, Column footings, Retaining wall	CO4	4
3.6	Road estimation-Estimation of earthwork from longitudinal section-metaled road	CO4	2
3.7	Estimation of sanitary and water supply work - Water tank, Septic tank , Manhole (Concept only)	CO4	1
4	**Module IV: Total lecture hours: 7**		
4.1	Valuation –Purpose, factor affecting- Introduction to terms-Value, Cost, Price, Income- Gross income, net income, outgoings, annuity, sinking fund (Simple Examples), Year's purchase, Depreciation, obsolescence -Free hold and leasehold properties.	CO5	2
4.2	Depreciation – methods of calculating depreciation – straight line method, constant percentage method, sinking fund method, and quantity survey method-numerical examples	C06	2
4.4	Methods of valuation of land with building – rental method, direct comparison of capital cost, valuation based on profit, depreciation method.	CO6	2
4.5	Various method of valuation of land (Brief description only)	CO6	1

Model Question Paper

Reg.No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

EIGHTH SEMESTER B. TECH DEGREE EXAMINATION

Course Code: CET402

Course Name: QUANTITY SURVEYING AND VALUATION

Max.Marks:100 Duration: 3Hours

General Instructions: 1. Supplement answers with illustrations, wherever necessary.

2. Assume any missing data and state the assumptions clearly. Assumptions should be realistic.

PART A

Answer Two full question

(10×2 marks = 20 marks)

Module 1 & II

1. a. Explain the terms (a) Cost index (b) Overhead charges (4)
   b. List different type of Estimate. Explain the detailed estimate (6)
2. a. What are different types of specification? (2)
   b. Reproduce the detailed specification for earthwork excavation for foundation (8)
3. Develop unit rate of the work (DSR 2018 item No. 4.1.2), providing and laying in position 1:1½:3 (1 Cement: 1½ coarse sand (zone-III) : 3 graded stone aggregate 20 mm nominal size) cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level : MATERIAL : 0.57cu.m 20mm nominal size of stone aggregate @ Rs.1370/cu.m., 0.28cu.m 10mm nominal size of stone aggregate @ Rs.1350/cu.m., 0.425 cu.m of coarse sand (Zone-III) @Rs.1350/cu.m., 0.2833cu.m Portland cement @ Rs.4940/tonne, LABOUR : 0.10 Mason @ Rs.709/day; 1.63 Beldar @ Rs.558/day, 0.70 Bhisti @ Rs.617/day. CARRIAGE PROVISIONS: Stone aggregate below 40mm Rs. 103.77/cu.m.; coarse sand @Rs.103.77/cu.m. and for cement @ Rs.92.24/tonne. HIRE CHARGES of concrete mixer 0.07@Rs.800/day, Vibrator 0.07@Rs.370/day, SUNDRIES , LS, 14.30@Rs.2 (10)

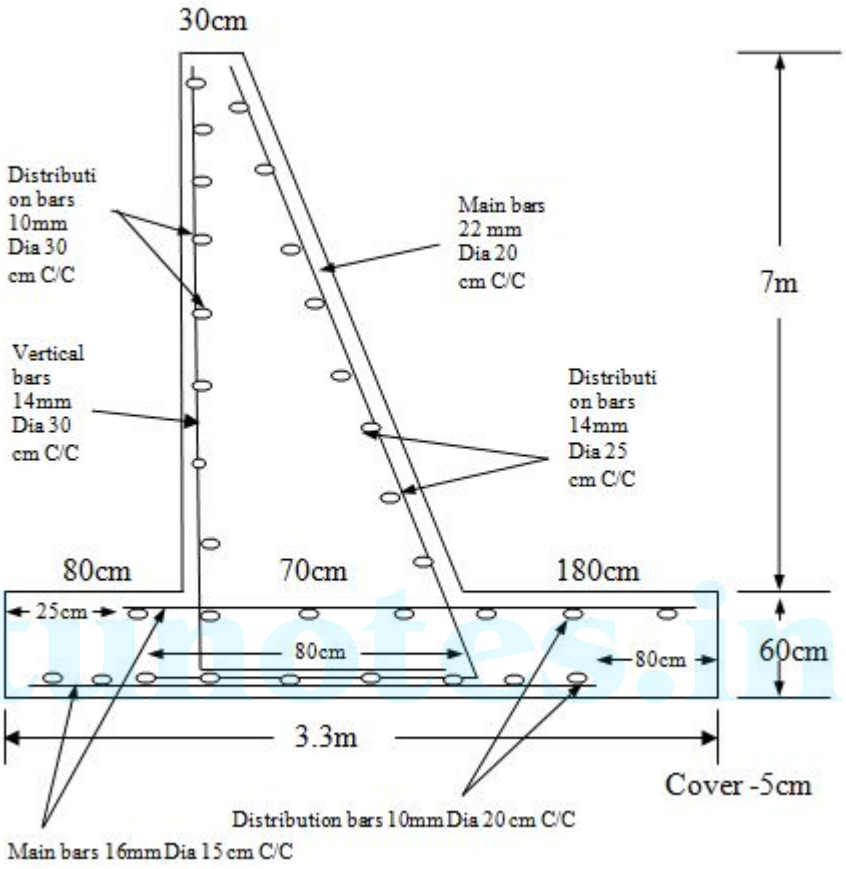
PART B

Answer Two full question

(2 x 25=50 Marks)

Module III

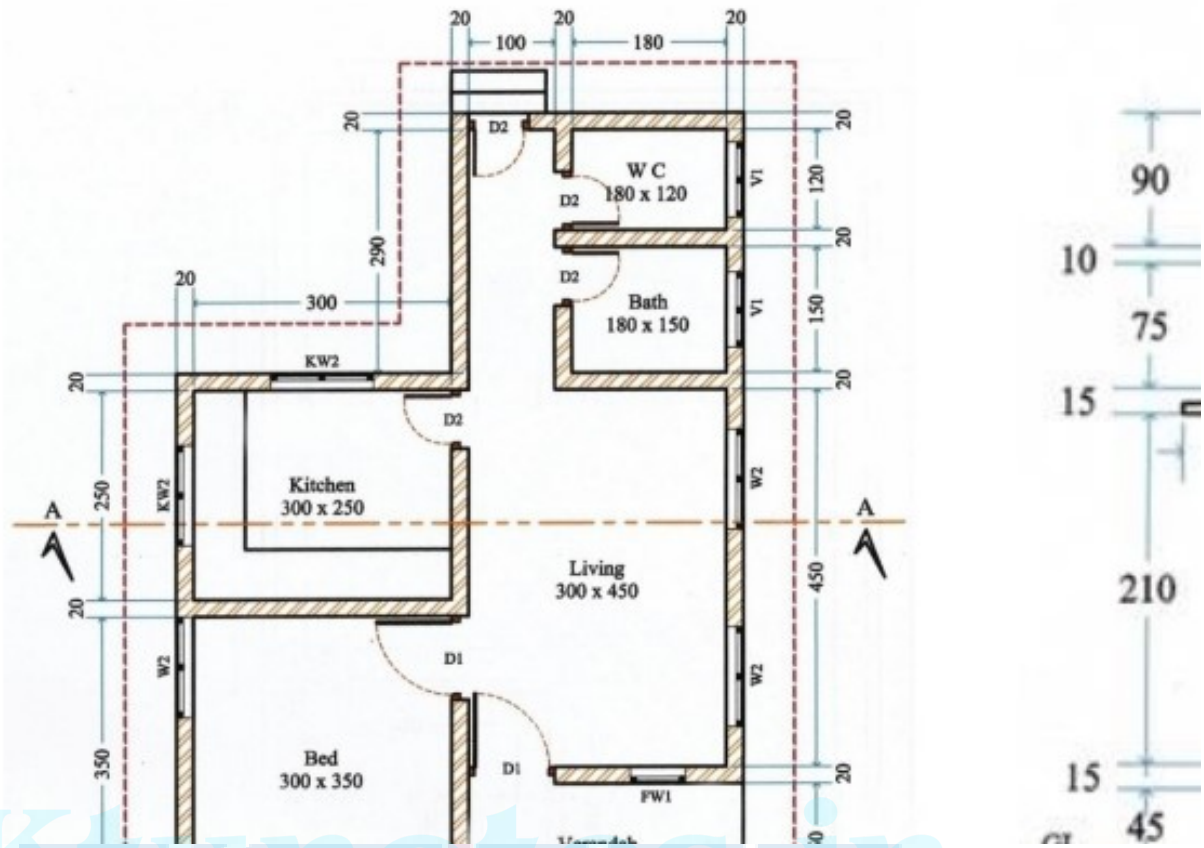
4. Prepare Schedule of bars and calculate the quantities of material required for constructing a retaining wall shown in figure. Length of retaining wall 20m.



5. Calculate the following quantity of the given plan using Centre line method. Assume suitable dimensions for Doors & Windows

(Door D1 -100x210; D2 -80x210; W2 -120x140; V1- 90x60; KW2- 120x90; FW1- 60x180)

(a) Earth work excavation, Width of base Concrete 75cm
(b) Foundation (60cm x 60cm) and basement (45cm x 45cm) with RR masonry
(c) Brick work for super structures, CM1:6
(d) RCC 1:2:4 for roof
(e) Wood work for door and windows



6. **a.** A simply supported beam of size 450 x 230 having a span of 6m is supported on a 30cm wall at both ends. The stirrups of 10mm diameter are provided at a spacing of 150mm c/c. The beam have main bar of 3 no's 20mm diameter at bottom including one bend up bar and stirrup holders are of 2 no's 16mm diameter at top. Main & Stirrup holder reinforcement is provided with a cover of 25mm. Calculate the total quantity of the reinforcement required for the stirrup for this beam. Also prepare an estimate of tor steel reinforcement for stirrup including cutting, bending , placing in position and binding, adopt the rate as Rs.95/kg. (10 Marks)

b. Calculate the quantity of earth work for a portion of road of length 700m. Formation width of road is 8m, side slope in banking 2: 1 and 1:1 in cutting, road has a down gradient of 1 in 150, formation level 160 at distance 0.

Distance (m)	0	100	200	300	400	500	6
Reduced	158.9	159.10	159.20	162.20	160.80	160.70	1

(15 Marks)

PART C

Answer Two full question

(2 x 15=30 Marks)

7. **a.** A concrete mixer was purchased at Rs.8000/-. Assuming salvage value to be Rs.1000, after5years, calculate depreciation for each year adopting (a) Straight line method (b) Constant percentage method and (c) Sinking fund method considering 6% interest. (8 marks)

   b. A lease-hold property is to produce a net income of Rs.12,000/- per annum for the next -60years. What is the value of the property? Assume that the land lord desires a return of 6% on his capital and the sinking fund to replace the capital is also to accumulate at 6%. What will be the value of the property if the rate of interest for redemption of capital is 3%? (7 marks)

8. **a.** Explain various method of land valuation (8 marks)

   b. Workout the valuation of a commercial building with the following data: Cost of land for life-time period of building is ₹.5,20,000/-. Gross income per year is ₹.8,50,000/- Expenses required per year: (a) staff salary, electric charges, municipal taxes including licenses fees, stationery and printing etc. is 20% of the gross income. (b) For repair and maintenance of lift, furniture etc. @ 5% of their capital cost of ₹.10,50,000/- (c) sinking fund for the items considered in capital cost, whose life is 25years @4% after allowing 10% scrap value. (d) Insurance premium is ₹.25,000/- per year. Take year's purchase @8% and annual repair of the building @2% on gross income. (8 marks)

9. a. List the factors affecting valuation. (5 marks)

   b. Explain the significance of sinking fund, How it is calculated. (5 marks)

   c. A person purchased a property for Rs.50,00,000/-. Assuming its salvage value after 40 years will be Rs. 5,00,000/-, determine amount of depreciation each year considering it to be uniform. (5 marks)

CET464	AIRQUALITY MANAGEMENT	CATEGORY	L	T	P	CREDIT	YEAR OF INTRODUCTION
		PEC	3	0	0	3	2019

Preamble: The course is designed to provide engineering knowledge on air pollution, air quality monitoring and air pollution control strategies among students. It motivates the students in maintaining and improving the air quality of the environment and empower learners to take appropriate actions to reduce the air pollution for the benefit of the society.

Pre-requisite: Nil

Course outcome :After the course, the student will able to:

CO1	Explain the sources of air pollution and different types of air pollutant.
CO2	Describe the effect of air pollutants on vegetation, animals, materials and human health.
CO3	Discuss the different methods of ambient air quality monitoring system which supports an air quality management program.
CO4	Explain the meteorological aspects of air pollutant dispersion.
CO5	Describe the various air pollution control strategies that can be undertaken to meet the air quality goals.

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3					2	2					
CO2	3					2	1					
CO3	3					2	2					
CO4	3					3	2					
CO5	3					2	2					

Assessment pattern

Bloom's Category	Continuous Assessment Tests		End Semester Examination (Marks)
	Test 1 (Marks)	Test 2 (Marks)	
Remember	15	15	30
Understand	20	20	40
Apply			
Analyze	10	10	20

Evaluate	5	5	10
Create			

Continuous Internal Evaluation Pattern:

Attendance : 10 marks
Continuous Assessment Test (2 numbers) : 25 marks
Assignment/Quiz/Course project : 15 marks
Total : 50 marks

End semester examination pattern – There will be two parts; Part A and Part B. Part A contain 10 questions with 2 questions from each module, having 3 marks for each question. Students should answer all questions. Part B contains 2 questions from each module of which student should answer any one. Each question can have maximum 2 sub-divisions and carry 14 marks.

Course Level Assessment Questions

Qn. No	Question	Marks	Course outcome (CO) Assessed
	Part A		
1	What are the criteria air pollutants?	3	CO1
2	Define air pollution.	3	CO1
3	Explain effect of carbon monoxide on human health.	3	CO2
4	What are the sources of indoor air pollution?	3	CO2
5	Enumerate the assumptions in Gaussian plume model.	3	CO3
6	Explain Pasquill's stability curves.	3	CO3
7	Discuss National Ambient Air Quality Standards.	3	CO4
8	Explain the devices used for sampling gases and vapours.	3	CO4
9	Write short notes on scrubbing.	3	CO5
10	List the different methods for controlling the particulate air pollutants.	3	CO5

	Part B **(Answer ANY ONE FULL question from each module)**		
Module I			
11(a)	Explain green house effect.	7	CO1
11(b)	Give a classification of the different types of air pollutants based on different criteria with suitable examples.	7	CO1
12	Explain major air pollution episodes.	14	CO1
Module II			
13(a)	Discuss the effects of indoor air pollutants.	7	CO2
13(b)	Discuss the effects of air pollutants on human health.	7	CO2
14(a)	Describe the effect of air pollution on environment.	9	CO2
14(b)	Write a short note on effect of air pollution on vegetation.	5	CO2
Module III			
15(a)	Explain the effect of meteorological factors on dispersion of air pollutant.	7	CO3
15(b)	Explain temperature lapse rate.	7	CO3
16	Explain advantages and disadvantages of Gaussian plume model.	14	CO3
Module IV			
17(a)	Briefly explain Emission Inventory.	5	CO4
17(b)	Explain the different methods for the collection of gaseous air pollutants.	9	CO4
18	Explain various methods used for the sampling of particulate air pollutants.	14	CO4
Module V			
19 (a)	Write short note on scrubbing.	5	CO5

19 (b)	Explain the working of an Electrostatic precipitator for particulate emission control. Also explain its advantages and disadvantages.	9	CO5
20	Explain various methods used for the control of particulate air pollutants.	14	CO5

Syllabus

Module I

Introduction- Components of Environment- Definition –Air Pollution- History of air pollution episodes- Sources of Air pollution – Industrial Processes causing Air Pollution- Air Pollutants- Types of Air Pollutants- Criteria Pollutants.

Module II

Effect of air pollutants on health, vegetation, animals and materials and environment- Green house effect - Indoor Air Pollution- Sources of indoor air pollutants- Effects of indoor air pollution.

Module III

Meteorological aspects of Air Pollutant Dispersion - Temperature and Pressure relationships- Atmospheric Stability- Temperature Lapse Rate- Inversions- Types, Plume behaviour. Dispersion of Air pollutants-Plume dispersion theory- Gaussian plume model (Derivation not required)- Assumptions- Advantages and Disadvantages- Pasquill's stability curves.

Module IV

Air Quality monitoring - Ambient air sampling - Collection of gaseous air pollutants-Collection of particulate Pollutants- Ambient Air Quality standards- Emission Inventory.

Module V

Control of Air Pollutants- Particulate emission control-methods, Scrubbing-Cyclones- Filtration- Electrostatic Precipitation-Gaseous emission control- adsorption, absorption, thermal methods.

Text Books :

1. C.S.Rao, “Environmental Pollution Control Engineering”, New Age International Pub., 2006

2. M.N. Rao & H.V.N Rao ,Air Pollution, Tata McGraw Hill Co. Ltd, Delhi, 1990.

3. Peavy H S, Rowe, D.R. Tchobanaglous “Environmental Engineering” McGraw Hill Education, 1985

References:

1. Beat Meyer, Indoor Air Quality, Addison – Wesley Publishers.

2. Chhatwal G. R., Encyclopedia of Environmental Pollution and Control, Vol.1, 2 &3, Anmol Publications.

3. Noel de Nevers, Air Pollution Control Engineering, McGraw Hill, New York, 1995.

4. J. R. Mudakavi, Principles and Practices of Air Pollution Control and Analysis, IK International Pvt Ltd, 2012

5. Perkins H.C, "Air Pollution" McGraw Hill Publications, 2004

6. S C Bhatia, Textbook of Air Pollution and Its Control , Atlantic publishers, 2007

7. S P Mahajan, Air Pollution Control, Common Wealth of Learning, Canada,

Indian Institute of Science, Bangalore, 2006

8. Stern.A, "Air Pollution" (Volume I ,II & III) ,Academic Press New York, 1962

Course content and Schedule of Lecture

Module	Topic	Course outcome addressed	No of Hours
Module I (7 Hours)			
1.1	Introduction- Components of Environment	CO1	1
1.2	Definition –Air Pollution	CO1	
1.3	History of air pollution episodes	CO1	1
1.4	Sources of Air pollution	CO1	1
1.5	Industrial Processes causing Air Pollution	CO1	1
1.6	Air Pollutants	CO1	1
1.7	Types of Air Pollutants	CO1	1
1.8	Criteria Pollutants	CO1	1
Module II (7 Hours)			
2.1	Effect of air pollutants on health	CO2	1
2.2	Effect of air pollutants on vegetation and animals	CO2	1
2.3	Effect of air pollutants on materials and environment	CO2	1
2.4	Effect of air pollutants on materials and environment	CO2	1
2.5	Green house effect	CO2	1
2.6	Indoor Air Pollution	CO2	

2.7	Sources of indoor air pollutants	CO2	1
2.8	Effects of indoor air pollution	CO2	1

Module III (7 Hours)			
3.1	Meteorological aspects of Air Pollutant Dispersion	CO3	1
3.2	Temperature and Pressure relationships	CO3	
3.3	Atmospheric Stability	CO3	1
3.4	Temperature Lapse Rate	CO3	1
3.5	Inversions- Types, Plume behaviour	CO3	1
3.6	Dispersion of Air pollutants -Plume dispersion theory	CO3	1
3.7	Gaussian plume model	CO3	1
3.8	Assumptions-Advantages and Disadvantages	CO3	
3.9	Pasquill's stability curves	CO3	1
Module IV (7 Hours)			
4.1	Air Quality monitoring	CO4	1
4.2	Ambient air sampling	CO4	1
4.3	Collection of gaseous air pollutants	CO4	1
4.4	Collection of particulate Pollutants	CO4	1
4.5	Collection of particulate Pollutants	CO4	1
4.6	Ambient Air Quality standards	CO4	1
4.7	Emission Inventory	CO4	1
Module V (7 Hours)			
5.1	Control of Air Pollutants	CO5	1
5.2	Particulate emission control-methods	CO5	1

5.3	Scrubbing-Cyclones	CO5	1
5.4	Filtration- Electrostatic Precipitation	CO5	1
5.5	Gaseous emission control	CO5	1
5.6	Adsorption, absorption, thermal methods.	CO5	1
5.7	Thermal methods.	CO5	1

Model Question Paper

Reg. No.:…….. **QP CODE:……..**

Name:……

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

EIGHTH SEMESTER B.TECH DEGREE EXAMINATION, MONTH & YEAR

Course Code: CET 464
Air Quality Management

Max. Marks: 100 **Duration: 3 hours**

Part A

(Answer all questions; each question carries 3 marks)

1. What are the criteria air pollutants?
2. Define air pollution.
3. Explain effect of carbon monoxide on human health.
4. What are the sources of indoor air pollution?
5. Enumerate the assumptions in Gaussian plume model.
6. Explain Pasquill's stability curves.
7. Discuss National Ambient Air Quality Standards.
8. Explain the devices used for sampling gases and vapours.
9. Write short notes on scrubbing.
10. List the different methods for controlling the particulate air pollutants.

Part B

(Answer one full question from each module; each question carries 14 marks)

Module I

11. a) Explain green house effect. (7 Marks)

b) Give a classification of the different types of air pollutants based on different criteria with suitable examples. (7 Marks)

OR

12. Explain major air pollution episodes. (14 Marks)

Module II

13. (a) Discuss the effects of indoor air pollutants. (7 Marks)
(b) Discuss the effects of air pollutants on human health. (7 Marks)

OR

14. (a) Describe the effect of air pollution on environment. (9 Marks)
(b) Write a short note on effect of air pollution on vegetation. (5 Marks)

Module III

15. (a) Explain the effect of meteorological factors on dispersion of air pollutant. (7 Marks)
(b) Explain temperature lapse rate. (7 Marks)

OR

16. Explain advantages and disadvantages of Gaussian plume model. (14 Marks)

Module IV

17. (a) Briefly explain Emission Inventory. (5 Marks)
(b) Explain the different methods for the collection of gaseous air pollutants. (9 Marks)

OR

18. Explain various methods used for the sampling of particulate air pollutants. (14 Marks)

Module V

19. (a) Write short note on scrubbing. (5 Marks)

(b) Explain the working of an Electrostatic precipitator for particulate emission control. Also explain its advantages and disadvantages. (9 Marks)

OR

20. Explain various methods used for the control of particulate air pollutants. (14 Marks)

CET456	REPAIR AND REHABILITATION OF BUILDINGS	CATEGORY	L	T	P	CREDIT	YEAR OF INTRODUCTION
		PEC	3	0	0	3	2019

Preamble : Repair and Rehabilitation of Buildings is an elective course in the study of construction engineering. The course provides basic idea and needs of maintenance, repair , rehabilitation and strengthening measures of building structures and helps students to identify various deterioration mechanisms or damage mechanisms in buildings . The course introduces both scientific aspects and its practical applications at the site. Various non-destructive techniques and semi destructive techniques are introduced in this course, for damage diagnosis and assessment of a structure at the site. Several practices for maintenance and rehabilitation like surface repair, corrosion protection, structural strengthening and stabilization, etc. are discussed in details. At the end of the course students will be able to suggest evaluation and repair/maintenance methods for extending the service life of buildings.

Prerequisite : CET 303 Design of Concrete Structures

Course Outcomes: After the completion of the course the student will be able to

Course Outcome	Description of Course Outcome	Prescribed learning level
CO1	Recall the basics ideas and theories associated with Concrete technology and Masonry structures.	Remembering
CO2	Understand the need and methodology of repair and rehabilitation of structures, the various mechanisms used, and tools for diagnosis of structures	Understanding
CO3	Identifying the criterions for repairing / maintenance and the types and properties of repair materials used in site. Learn various techniques for repairing dam- aged and corroded structures	Understanding
CO4	Proposing wholesum solutions for maintenance/re-habilitation and applying methodologies for repair- ing structures or demolishing structures.	Applying
CO5	Analyse and asses the damage to structures using various tests	Analysing

Mapping of course outcomes with program outcomes (Minimum requirement)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1											
CO2	3	2		2								
CO3	3	2	3		3	2	1					
CO4	3			1	3	2	1					
CO5	3	2	2	1	2		2					

Assessment Pattern

Bloom's Category	Continuous Assessment Tests		End Semester Examination
	1	2	
Remember	10	10	10
Understand	20	20	40
Apply	10	10	20
Evaluate			
Analyse	10	10	30
Create			

Mark distribution

Total Marks	CIE	ESE	ESE Duration
150	50	100	3 hours

Continuous Internal Evaluation Pattern:

Attendance : 10
Continuous Assessment Test (2 numbers) : 25
marks Assignment/Quiz/Course project : 15

End Semester Examination Pattern: There will be two parts; Part A and Part B. Part A contain 10 questions with 2 questions from each module, having 3 marks for each question. Students should answer all questions. Part B contains 2 questions from each module of which student should answer any one. Each question carries 14 marks and can have maximum 2 sub-divisions.

Course Level Assessment (Sample) Questions

CO1: Recall the basics ideas and theories associated with Concrete technology and Masonry structures.

1. Discuss in details thermal properties of concrete
2. Discuss in detail the quality assurance for Concrete Construction
3. Write a brief note on permeability concrete
4. What are the factors affecting the durability of concrete?
5. Write a short note on effect of cover thickness?

CO2: Understand the need and methodology of repair and rehabilitation of structures, the various mechanisms used ,and tools for diagnosis of structures

1. What is underpinning?
2. Discuss the step by step procedure for epoxy injection to repair cracks in concrete
3. Briefly explain the various types of corrosion inhibitors
4. Enlist Strengthening Techniques and discuss the factors affecting strengthening methods
5. In which situation self compacting concrete is desirable?

CO3: Identifying the criterions for repairing / maintenance and the types and properties of repair materials used in site. Learn various techniques for repairing damaged and corroded structures

1. How do you classify maintenance of a structure?
2. What is overlay?
3. Elucidate Cathodic Protection of Steel Concrete?

CO4: Proposing wholesum solutions for maintenance/rehabilitation and applying methodologies for repairing structures or demolishing structures.

1. How can you develop a demolition strategy?
2. Describe a detailed assessment procedure for evaluating a damaged structure using a flow chart
3. How do you repair and rehabilitate a structure distressed due to fire.

CO5: Analyse and asses the damage to structures using various tests

1. Explain any three Non Destructive Tests used to test the strength of Concrete
2. What are partial destructive tests. Explain any one of them.
3. With a graph explain the service life behaviour of a concrete structure. Also explain in detail about time based maintenance

Syllabus

Module 1

Introduction - Maintenance, rehabilitation, repair, retrofit and strengthening, need for rehabilitation of structures. Cracks in R.C. buildings - Various cracks in R.C. buildings, causes and effects Damages to masonry structures - Various damages to masonry structures and causes

Module 2

Damage diagnosis and assessment - Various aspects of Inspection, Assessment procedure for evaluating a damaged structure, Visual inspection, Non Destructive Testing using Rebound hammer, Ultra sonic pulse velocity, Semi destructive testing, Probe test, Pull out test, Chloride penetration test, Carbonation, Carbonation depth testing, Corrosion activity measurement, Core test, Load test.

Module 3

Strength and Durability of Concrete - Quality assurance for concrete – Strength, Durability and Thermal properties of concrete – Effects due to climate, temperature, Sustained elevated temperature, Corrosion - effects of cover thickness. Substrate preparation - Importance of substrate/surface preparation, General surface preparation methods and procedure, reinforcing steel cleaning.

Module 4

Maintenance - Maintenance importance of maintenance, routine and preventive maintenance.
Repair materials -Various repair materials, Criteria for material selection, Methodology of selection, Health and Safety precautions for handling and applications of repair materials.
Special mortars and concretes- Polymer concrete, Sulphur infiltrated concrete, Fibre reinforced concrete, High strength concrete, High performance concrete, Vacuum concrete, Self compacting concrete, Self-healing concrete, Geopolymer concrete, Reactive powder concrete, Concrete made with industrial wastes, Polymer Concrete and Mortar, Quick setting compounds, Gunite and Shotcrete, Expansive cement, Ferro cement, Concrete chemicals.
Grouting materials - Gas forming grouts, Salfoaluminate grouts, Polymer grouts, Acrylate and Urethane grouts.
Bonding agents - Latex emulsions, Epoxy bonding agents.
Protective coatings - Protective coatings for Concrete and
Steel. FRP sheets

Module 5

Crack repair - Various methods of crack repair, Grouting, Routing and sealing, Stitching, Dry packing, Autogenous healing, Overlays, Repair to active cracks, Repair to dormant cracks.
Corrosion of embedded steel in concrete - Corrosion of embedded steel in concrete, Mechanism, Stages ofcorrosion damage, Repair of various corrosion damaged of structural elements (slab, beam and columns) , Cathodic protection.
Jacketing - Jacketing, Column jacketing, Beam jacketing, Beam Column joint jacketing, Reinforced concrete jackets, Steel jacketing, FRP jacketing.
Strengthening - Strengthening of Structural elements, fire, Leakage, earthquake, Epoxy injection, Shoring, Underpinning.

Demolition Techniques - Non-explosive demolition, and Explosive demolition, engineered demolition techniques for dilapidated structures - Wrecking Ball Method, Concrete Sawing Method, Top down method, Hydraulic crusher, Implosion by delayed detonation technique

Text Books:

1. Concrete repair and maintenance Illustrated by Peter.H.Emmons, Galgotia publications Pvt. Ltd., 2001.
2. Repair and protection of concrete structures by Noel P.Mailvaganam, CRC Press, 1991.
3. "Earthquake resistant design of structures" by Pankaj agarwal, Manish shrikande, PHI, 2006.
4. "Concrete Structures, Materials, Maintenance and Repair", Denison Campbell, Allen and Harold Roper, Longman Scientific and Technical UK, 1991.
5. Repair of Concrete Structures, Allen R.T. & Edwards S.C, Blakie and Sons, UK, 1987

References:

1. Failures and repair of concrete structures by S.Champion, John Wiley and Sons, 1961.
2. Diagnosis and treatment of structures in distress by R.N.Raikar Published by R & D Centre of Structural Designers and Consultants Pvt.Ltd, Mumbai.
3. Handbook on repair and rehabilitation of RCC buildings, CPWD, Government of India.
4. Handbook on seismic retrofit of buildings, A. Chakrabarti et.al., Narosa Publishing House, 2010
5. "Concrete Technology – Theory and Practice", ShettyM.S., S.Chand and Company, 2008.
6. "Design and Construction Failures", Dov Kominetzky.M.S., Galgotia Publications Pvt. Ltd., 2001
7. "Structural Health Monitoring, Repair and Rehabilitation of Concrete Structures", Ravishankar.K., Krishnamoorthy.T.S, Allied Publishers, 2004.
8. Hand book on Seismic Retrofit of Buildings, CPWD and Indian Buildings Congress, Narosa Publishers, 2008.
9. "Concrete Technology", Gambhir.M.L., McGraw Hill, 2013
10. "Self-Healing Concrete", David J. Fisher, Materials Research Forum LLC, 20-May-2021
11. "Demolition: Practices, Technology, and Management", Richard J. Diven, Mark Shaurette, 2011

Course Contents and Lecture Schedule

Module	Topic Course	Course Outcomes Addressed	No. of Lectures
1	**Module I : Total lecture hours : 6**		
1.1	Introduction - Maintenance, rehabilitation, repair, retrofit and strengthening, need for rehabilitation of structures	CO1 , CO2	1
1.2	Cracks in R.C. buildings - Various cracks in R.C. buildings, causes and effects	CO2	2
1.3	Damages to masonry structures - Various damages to masonry structures and causes	CO1	3
2	**Module II : Total lecture hours : 8**		
2.1	Damage diagnosis and assessment - Various aspects of Inspection, Assessment procedure for evaluating a damaged structure	CO2 , CO4, CO5	2
2.2	Visual inspection, Non Destructive Testing using Rebound hammer, Ultra sonic pulse velocity,	CO2 ,CO4	2
2.3	Semi destructive testing , Probe test, Pull out test, Chloride penetration test, Carbonation,	CO2, CO4	2
2.4	Carbonation depth testing, Corrosion activity measurement, Core test, Load test.	CO2 , CO4	**2**
3	**Module III : Total lecture hours : 7**		
3.1	Strength and Durability of Concrete - Quality assurance for concrete – Strength, Durability and Thermal properties of concrete	CO1 , CO3	1
3.2	Effects due to climate, temperature, Sustained elevated temperature, Corrosion - effects of cover thickness.	CO2 , CO3, CO4	2
3.3	Substrate preparation - Importance of substrate/ surface preparation,	CO2	2
3.4	General surface preparation methods and procedure, reinforcing steel cleaning.	CO3 , CO5	2
4	**Module IV : Total lecture hours : 7**		
4.1	Maintenance - Maintenance importance of maintenance, routine and preventive maintenance.	CO2,CO4	1
4.2	Repair materials -Various repair materials, Criteria for material selection, Methodology of Selection	CO2,CO1	1
4.3	Health and safety precautions for handling and applications of repair materials	CO2,CO3	1

4.4	Special mortars and concretes- Polymer concrete, Sulphur infiltrated concrete, Fibre reinforced concrete, High strength concrete,	CO1, CO2	1
4.5	High performance concrete, Vacuum concrete, Self compacting concrete, Self-healing concrete, Geopolymer concrete, Reactive powder concrete,	CO2, CO5	1
4.6	Concrete made with industrial wastes, Polymer Concrete and Mortar, Quick setting compounds, Gunite and Shotcrete, Expansive cement, Ferro cement, Concrete chemicals.	CO1, CO2, CO4	1
4.7	Grouting materials - Gas forming grouts, Salfoaluminate grouts, Polymer grouts, Acrylate and Urethane grouts. Bonding agents - Latex emulsions, Epoxy bonding agents. Protective coatings - Protective coatings for Concrete and Steel. FRP sheets	CO2, CO1	1
5	**Module V : Total lecture hours : 7**		
5.1	Crack repair - Various methods of crack repair, Grouting, Routing and sealing, Stitching, Dry packing, Autogenous healing, Overlays, Repair to active cracks, Repair to dormant cracks.	CO2, CO3	1
5.2	Corrosion of embedded steel in concrete - Corrosion of embedded steel in concrete, Mechanism, Stages ofcorrosion damage, Repair of various corrosion damaged of structural elements (slab, beam and columns) , Cathodic protection.	CO1,CO2	1
5.3	Jacketing - Jacketing, Column jacketing, Beam jacketing, Beam Column joint jacketing, Reinforced concrete jackets, Steel jacketing, FRP jacketing.	CO2, CO5	1
5.4	Strengthening - Strengthening of Structural elements, fire, Leakage, earthquake, Epoxy injection, Shoring, Underpinning.	CO2, CO1	1
5.5	Demolition Techniques - Non-explosive demolition, and Explosive demolition,	CO2, CO1	1
5.6	Engineered demolition techniques for dilapidated structures - Wrecking Ball Method, Concrete Sawing Method, Top down method, Hydraulic crusher, Implosion by delayed detonation technique.	CO2, CO4, CO5	2

Model Question Paper

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
EIGHTH SEMESTER B. TECH DEGREE EXAMINATION, MONTH & YEAR

Course Code: CET 456
Course Name: REPAIR AND REHABILITATION OF BUILDINGS

Marks : 100 Duration : 3 hrs

PART A
(Answer all Questions. Each Question carries 3 Marks)

1. What is Inspection and Mention its purpose?
2. What is the difference between maintenance and rehabilitation of structures ?
3. List any three causes of detrioration of structures ?
4. State the properties of Corrossion Inhibitors ?
5. List four engineered demolition techniques for RCC structures ?
6. List two methods of retrofitting of concrete structures subjected to leakage ?
7. What is Shoring and state its purpose?
8. Define Durability and name two tests to assess durability.
9. Mention a salient feature and application of polymer concrete.
10. List the types of Polymer Concrete

PART B
(Answer one full question from each module, Each question carries 14 marks)
Module 1

11. What are the types of Cracks in R.C.C buildings . Explain the causes and effects .

OR

12. Explain the service life behaviour of a concrete structure with a Graph. Also explain in detail about time based maintenance.

Module 2

13. Explain the following Non Destructive Testing techniques in detail as per IS
    i) Rebound Hammer Test
    ii) Ultrasonic Pulse Velocity

OR

14. Explain the following Testing techniques in detail as per IS
    i) Semi destructive testing

ii) Probe test
iii) Pull out test
iv) Chloride penetration test

Module 3

15. Discuss the effects of temperature and climate on concrete structures

OR

16. Discuss in detail the quality assurance for Concrete Construction

Module 4

17. (a) Explain carbonation of concrete in detail.
(b)Write a brief note on Ferrocement

OR

18. (a)Write short note on expansive cement
(b) Definie alkali aggregate reaction, explain causes and preventive measures of alkali aggregate reaction

Module 5

19. Discuss the implosion method of demolition of Structures .

OR

20. How do you repair and rehabilitate a structure damaged due to fire.

CET438	AIRPORT, SEAPORT AND HARBOUR ENGINEERING	CATEGORY	L	T	P	CREDIT	YEAR OF INTRODUCTION
		PEC	3	0	0	3	2019

Preamble : Objective of the course is to introduce the principles of planning design and practice of Airport, Sea port and Harbor Engineering.

Prerequisite: Nil

Course Outcomes: At the end of the course, students will be able to

CO 1	Explain the basic principles of planning and design for site selection, Airport components based on air traffic characteristics
CO 2	Explain the basic design principles of Runway orientation, basic runway length and corrections required, Geometric design of runways, Design of taxiways and aprons, Terminal area planning,
CO 3	Explain various aspects such as Airport markings, Lighting of runway approaches, taxiways and aprons, Air traffic control methods.
CO 4	Explain the basic principles ,site selection characteristics ,lay out ,break waters, quays, piers, wharves, jetties, transit sheds and warehouses - navigational aids - light houses, signals - types - Moorings
CO 5	Explain the basics of Docks – Functions and types - dry docks, wet docks arrangement of basins and docks

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	3	3	3	1		1	3	1		2		1
CO 2	3	1	3	1		1	1	1		1		1
CO 3	3	2	2	1					1	2		2
CO 4	2						2	1				2
CO 5	3	3	3			3		2				

Assessment Pattern

Bloom's Category	Continuous Assessment		End Semester Examination (marks)
	Test 1 Marks	Test 2 Marks	
Remember	7.5	7.5	30
Understand	7.5	7.5	30
Apply	5	5	20
Analyse	5	5	20
Evaluate			
Create			

Mark Distribution

Total Marks	CIE (Marks)	ESE (Marks)	ESE Duration
150	50	100	3 hours

Continuous Internal Evaluation Pattern:

Attendance : 10 marks
Continuous Assessment Test (2 numbers) : 25 marks
Assignment/Quiz/Course Project : 15 marks

End Semester Examination Pattern:

The question consists of two parts- Part A and Part B. Part A consists of 10 questions with 3marks for each (two questions from each module). Part B consists of two questions from each module, out of which one has to be answered. Each question carries 14 marks and can have maximum 2 subdivisions.

Sample Course Level Assessment Questions:

Course Outcome 1 (CO1):
Explain the basic principles to be followed for selection of sites and planning of Airport. Explain the various air traffic characteristics and standards as per ICAO and FAA

Course Outcome 2 (CO2):
Apply the basic principles to be followed for runway orientation and design. Explain the various types' correction to be applied for runway design.Solve Problem related to application of correction like temperature, altitude

Course Outcome 3 (CO3):
Elaborate the principles and functions and working of airport markings and lighting. Different means of air traffic control.

Course Outcome 4 (CO4):
Explain the function and design aspects of marine structures like break waters, quays, piers, wharves, jetties and functions and working of different types of navigational aids

Course Outcome 5 (CO5):
Discuss the principles, types, design considerations, functions and working of wet and dry Docks

Syllabus

Module	Contents	Hours
I	**Introduction to Airport Engineering**, Components of airport, selection of site for airport. Requirements of an ideal airport layout. Aircrafts and its characteristics, airport classifications as per ICAO. Location and planning of airport as per ICAO and F.A.A. recommendations, airport Elements -airfield, terminal area,	8
II	**Run Way Design-** Wind rose diagram and orientation of runway, wind coverage and crosswind component, factors affecting runway length, basic runway length, and corrections to runway length, runway geometrics and runway patterns (configurations). Design of taxiways and aprons, Terminal area planning, obstructions, approach zone, zoning laws, airport capacity, airport size (introduction only)	8
III	**Introduction to Airport markings**, Runway marking, Lighting of runway approaches, taxiways and aprons, Air traffic control-objectives, control system, control network-visual aids-landing information system,	5
IV	**Harbours** – Harbour components, ship characteristics, characteristics of good harbour, and principles of harbour planning, size of harbour, site selection criteria and layout of harbours, classification, features, requirements. Break waters quays, piers, wharves, jetties, transit sheds and warehouses - necessity and functions, classification. navigational aids - light houses, signals - types - Channel and entrance demarcation, buoys, beacons, light house communication devices	8

V	**Docks** – Functions and types - dry docks, wet docks-purpose, design consideration, operation of lock gates and passage, repair docks - graving docks, floating docks and repair of docks	7

Text Books

1. Khanna S K, Arora M G and Jain S S, "Airport Planning and Design", Nemchand and Brothers, Roorkee, 2012.
2. Bindra S P, "A Course in Docks and Harbour Engineering", Dhanpat Rai and Sons, New Delhi, 2013
3. Rangwala S C "Airport Engineering", Charotar Publishing company 16 e, 2016.
4. Rangwala, "Harbor Engineering", Charotar Publishing House, 2013.
5. Oza.H.P. and Oza.G.H., "A course in Docks & Harbour Engineering". Charotar Publishing Co., 2013
6. Srinivasan R. " Harbour,Dock and Tunnel Engineering", 28th Edition
7. G.V. Rao Airport Engineering Tata McGraw Hill Pub. Co.

References

1. Horonjeff R. and McKelvy, F., Planning and Design of Airports, McGraw Hill, 5e, 2010

Course Content and lecture Schedule:

No.	Topic	Course Outcome	No. of Hr
1	**Module 1**		**Total:8**
1.1	Introduction, air port components, site selection	CO1	3
1.2	Requirements of an ideal airport layout. Aircrafts and its characteristics,	CO1	3
1.3	Airport classifications as per ICAO. Location and planning of airport, airport Elements -airfield, terminal area,	CO1	2
2	**Module 2**		**Total: 8**
2.1	**Run Way Design-** Wind rose diagram and orientation of runway, wind coverage and crosswind component	CO2	2
2.2	Factors affecting runway length, basic runway length, and corrections to runway length, runway geometrics and runway patterns (configurations).	CO2	3
2.3	Design of taxiways and Aprons, Terminal area planning,	CO2	1
2.4	Approach zone, zoning laws, airport capacity, airport size (introduction only)	CO2	2
3	**Module 3**		**Total: 5**
3.1	Introduction to Airport markings, Runway markings	CO3	1
3.2	Lighting of runway approaches, taxiways and aprons,	CO3	2
3.3	Air traffic control-objectives, control system, control network-visual aids-landing information system,	CO3	2
4	**Module 4**		**Total: 8**
4.1	Harbor Planning: Basic principles ,site selection characteristics	CO4	3
4.2	**Classification, features, requirements**. Of Break waters quays, piers, wharves, jetties, transit sheds and warehouses - necessity and functions, classification.	CO4	3

4.3	**Navigational aids** - light houses, signals - types - Channel and entrance demarcation, buoys, beacons, light house communication devices	CO4	2
5	**Module 5**		**Total: 7**
5.1	Functions -types and purpose of docks	CO5	2
5.2	Design considerations of docks	CO5	2
5.3	Operation of lock gates and passage, repair docks - graving docks, floating dock	CO5	3

Model Question Paper

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
EIGHTH SEMESTER B. TECH DEGREE EXAMINATION, MONTH & YEAR
Course Code: **CET 438**

Course Name: **AIRPORT, SEAPORT AND HARBOUR ENGINEERING**

Marks:100 Duration: 3 hrs

PART A
(Answer all questions. Each question carry three marks)

1. With a sketch, Describe aero plane components parts draw sketch.
2. Enumerate the various factors which would be kept in view while selecting Site for air port
3. What are functions of taxiways?
4. Explain the term wind rose Diagram
5. Give the classification of air traffic control systems .
6. Explain objectives of runway lightings
7. Define the following terms (1) Harbour, (2) Port, (3) Fenders,
8. (i) define terms:- tides, turning basin breakwater, draft
9. Why fenders are provided on docking platform? Draw the sketch of wooden and rubber fenders.
10. Differentiate between gravity docks and floating docks

.

PART B
(Answer one full question from each module)

11. a) Give the classification of airports as per I.C.A.O. &Enlist components of an airport 7

b) Requirements of an ideal airport layout 7

OR

12. a) Explain the various factors to be considered for selection of site for airport. 7

b) Explain the principles of planning of airport as per ICAO and F.A.A recommendations 7

13.a) The length of a runway under standard conditions is 1500m. The airport is to be provided at an elevation of 110m above mean sea level. The airport reference temperature is 320C. Following data refers to the proposed longitudinal section of runway. Determine the corrected length of runway.

End to end of runway (m)	Grade (%)	End to end of runway (m)	Grade (%)
0 to 300	+1	1500 to 1800	+1
300 to 900	-0.2	1800 to 2100	-0.3
900 to 1500	+0.5		

14

OR

14. a)Explain by drawing sketch wind rose diagram type II showing direction, duration and intensity of wind. 7

b) What are the purposes of airport terminal building? Draw layout of airport terminal building 7

OR

15 a) Explain with sketches the various of Runway markings and salient features 7

b) List out the various visual aid visual aids-landing information system, Explain any one 7

OR

16a) what are the advantages lighting of runway approaches? 7

b) What are variouscontrol system, usedin airports. 7

17 a) State the natural and meteorological phenomena a harbour engineer has to study and briefly mention the effects of these phenomena 14

OR

18a) What is breakwater? Explain designfeatures of break water 6

b) Explain necessity and functions transit sheds and warehouses 8

.

19 a) Describethe working of a lock with sketches. 6

b) Explain with sketches the basic principle of gravity dock 8

OR

20 a) What are the various types of docks .Explain the primary functions of docks 10

b) draw sketch of floating Dock 4

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CET404	COMPREHENSIVE COURSE VIVA	CATEGORY	L	T	P	CREDIT
		PCC	1	0	0	1

Preamble: The objective of this Course viva is to ensure the basic knowledge of each student in the most fundamental core courses in the curriculum. The viva voce shall be conducted based on the core subjects studied from third to eighth semester. This course helps the learner to become competent in placement tests and other competitive examinations.

Guidelines

1. The course should be mapped with a faculty and classes shall be arranged for practicing questions based on the core courses listed in the curriculum.
2. The viva voce will be conducted by the same three member committee assigned for final project phase II evaluation. It comprises of Project coordinator, expert from Industry/research Institute and a senior faculty from a sister department.
3. The pass minimum for this course is 25.
4. The mark will be treated as internal and should be uploaded along with internal marks of other courses.
5. Comprehensive Viva should be conducted along with final project evaluation by the three member committee.

Mark Distribution

Total marks: 50, only CIE, minimum required to pass : 25 Marks

CED416	PROJECT PHASE II	CATEGORY	L	T	P	CREDIT
		PWS	0	0	12	4

Preamble: The course 'Project Work' is mainly intended to evoke the innovation and invention skills in a student. The course will provide an opportunity to synthesize and apply the knowledge and analytical skills learned, to be developed as a prototype or simulation. The project extends to 2 semesters and will be evaluated in the 7th and 8th semester separately, based on the achieved objectives. One third of the project credits shall be completed in 7th semester and two third in 8th semester. It is recommended that the projects may be finalized in the thrust areas of the respective engineering stream or as interdisciplinary projects. Importance should be given to address societal problems and developing indigenous technologies.

Course Objectives

- To apply engineering knowledge in practical problem solving.
- To foster innovation in design of products, processes or systems.
- To develop creative thinking in finding viable solutions to engineering problems.

Course Outcomes [COs]: After successful completion of the course, the students will be able to:

CO1	Model and solve real world problems by applying knowledge across domains (Cognitive knowledge level: **Apply**).
CO2	Develop products, processes or technologies for sustainable and socially relevant applications (Cognitive knowledge level: **Apply**).
CO3	Function effectively as an individual and as a leader in diverse teams and to comprehend and execute designated tasks (Cognitive knowledge level: **Apply**).
CO4	Plan and execute tasks utilizing available resources within timelines, following ethical and professional norms (Cognitive knowledge level: **Apply**).
CO5	Identify technology/research gaps and propose innovative/creative solutions (Cognitive knowledge level: **Analyze**).
CO6	Organize and communicate technical and scientific findings effectively in written and oral forms (Cognitive knowledge level: **Apply**).

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	2	1	2	2	2	1	1	1	1	2
CO2	2	2	2		1	3	3	1	1		1	1
CO3									3	2	2	1
CO4					2			3	2	2	3	2
CO5	2	3	3	1	2							1
CO6					2			2	2	3	1	1

Abstract POs defined by National Board of Accreditation			
PO #	**Broad PO**	**PO#**	**Broad PO**
PO1	Engineering Knowledge	PO7	Environment and Sustainability
PO2	Problem Analysis	PO8	Ethics
PO3	Design/Development of solutions	PO9	Individual and team work
PO4	Conduct investigations of complex problems	PO0	Communication
PO5	Modern tool usage	PO11	Project Management and Finance
PO6	The Engineer and Society	PO12	Lifelong learning

PROJECT PHASE II

Phase 2 Targets

- In depth study of the topic assigned in the light of the report prepared under Phase - I;
- Review and finalization of the approach to the problem relating to the assigned topic.
- Preparing a detailed action plan for conducting the investigation, including teamwork.
- Detailed Analysis/ Modeling / Simulation/ Design/ Problem Solving/Experiment as needed.
- Final development of product/ process, testing, results, conclusions and future directions.
- Preparing a paper for Conference Presentation/ Publication in Journals, if possible.
- Presenting projects in Project Expos conducted by the University at the cluster level and/ or state level as well as others conducted in India and abroad.
- Filing Intellectual Property Rights (IPR) if applicable.
- Preparing a report in the standard format for being evaluated by the Department Assessment Board.
- Final project presentation and viva voce by the assessment board including the external expert.

Evaluation Guidelines & Rubrics

Total: 150 marks (Minimum required to pass: 75 marks).

- Project progress evaluation by guide: 30 Marks.
- Two interim evaluations by the Evaluation Committee: 50 Marks (25 marks for each evaluation).
- Final evaluation by the Final Evaluation committee: 40 Marks
- Quality of the report evaluated by the evaluation committee: 30 Marks

(The evaluation committee comprises HoD or a senior faculty member, Project coordinator and project supervisor. The final evaluation committee comprises of Project coordinator, expert from Industry/research/academic Institute and a senior faculty from a sister department).

Evaluation by the Guide

The guide/supervisor must monitor the progress being carried out by the project groups on regular basis. In case it is found that progress is unsatisfactory it should be reported to the Department Evaluation Committee for necessary action. The presence of each student in the group and their involvement in all stages of execution of the project shall be ensured by the guide. Project evaluation by the guide: 30 Marks. This mark shall be awarded to the students in his/her group by considering the following aspects:

Project Scheduling & Distribution of Work among Team members: Detailed and extensive Scheduling with timelines provided for each phase of project. Work breakdown structure well defined. (5)

Literature survey: Outstanding investigation in all aspects. (4)

Student's Diary/ Daily Log: The main purpose of writing daily diary is to cultivate the habit of documenting and to encourage the students to search for details. It develops the students' thought process and reasoning abilities. The students should record in the daily/weekly activity diary the day to day account of the observations, impressions, information gathered and suggestions given, if any. It should contain the sketches & drawings related to the observations made by the students. The daily/weekly activity diary shall be signed after every day/week by the guide. (7)

Individual Contribution: The contribution of each student at various stages. (9)

Completion of the project: The students should demonstrate the project to their respective guide. The guide shall verify the results and see that the objectives are met. (5)

EVALUATION RUBRICS for PROJECT Phase II: Interim Evaluation - 1						
No.	**Parameters**	**Marks**	**Poor**	**Fair**	**Very Good**	**Outstanding**
2-a	Novelty of idea, and Implementation scope [CO5] [Group Evaluation]	**5**	The project is not addressing any useful requirement. The idea is evolved into a non-implementable one. The work presented so far is lacking any amount of original work by the team.	Some of the aspects of the proposed idea can be implemented. There is still lack of originality in the work done so far by the team. The project is a regularly done theme/topic without any freshness in terms of specifications, features, and/or improvements.	Good evidence of an implementable project. There is some evidence for the originality of the work done by the team . There is fresh specifications/ features/improvements suggested by the team. The team is doing a design from fundamental principles, and there is some independent learning and engineering ingenuity.	The project has evolved into incorporating an outstandingly novel idea. Original work which is not yet reported anywhere else. Evidence for ingenious way of innovation which is also Implementable. Could be a patentable / publishable work.
			(0 – 1 Marks)	(2 – 3 Marks)	(4 Marks)	(5 Marks)
2-b	Effectiveness of task distribution among team members. [CO3] [Group Evaluation]	**5**	No task distribution of any kind. Members are still having no clue on what to do.	Task allocation done, but not effectively, some members do not have any idea of the tasks assigned. Some of the tasks were identified but not followed individually well.	Good evidence of task allocation being done, supported by project journal entries, identification of tasks through discussion etc. However, the task distribution seems to be skewed, and depends a few members heavily than others. Mostly the tasks are being followed by the individual members.	Excellent display of task identification and distribution backed by documentary evidence of team brainstorming, and project journal entries. All members are allocated tasks according to their capabilities, and as much as possible in an equal manner. The individual members are following the tasks in an excellent manner.
			(0 – 1 Marks)	(2 – 3 Marks)	(4 Marks)	(5 Marks)
2-c	Adherence to project schedule. [CO4] [Group Evaluation]	**5**	Little or no evidence of continued planning or scheduling of the project. The students did not stick to the plan what they were going to build nor plan on what materials / resources to use in the project. The students do not have any idea on the budget required even after the end of phase - I. No project journal kept or the journal.	There is some improvement in the primary plan prepared during phase I. There were some ideas on the materials /resources required, but not really thought out. The students have some idea on the finances required, but they have not formalized a budget plan. Schedules were not prepared. The project journal has no useful details on the project.	Good evidence of planning done and being followed up to a good extent after phase I. Materials were listed and thought out, but the plan wasn't followed completely. Schedules were prepared, but not detailed, and needs improvement. Project journal is presented but it is neither complete nor updated regularly.	Excellent evidence of enterprising and extensive project planning and follow-up since phase I. Continued use of project management/version control tool to track the project. Material procurement if applicable is progressing well. Tasks are updated and incorporated in the schedule. A well-kept project journal showed evidence for all the above, in addition to the interaction with the project guide.
			(0 - 1 Marks)	(2 - 3 Marks)	(4 Marks)	(5 Marks)

2-d	Interim Results. [CO6] [Group assessment]	**5**	There are no interim results to show.	The team showed some interim results, but they are not complete / consistent to the current stage, Some corrections are needed.	The interim results showed were good and mostly consistent/correct with respect to the current stage. There is room for improvement.	There were significant interim results presented which clearly shows the progress.
			(0 - 1 Marks)	(2 - 3 Marks)	(4 Marks)	(5 Marks)
2-e	Presentation [Individual assessment]	**5**	Very poor presentation and there is no interim results. The student has no idea about the project proposal.	Presentation is average, and the student has only a feeble idea about the team work.	Good presentation. Student has good idea about the team's project. The overall presentation quality is good.	Exceptionally good presentation. Student has excellent grasp of the project. The quality of presentation is outstanding.
			(0 - 1 Marks)	(2 - 3 Marks)	(4 Marks)	(5 Marks)
Phase-II Interim Evaluation - 1 Total Marks: 25						

EVALUATION RUBRICS for PROJECT Phase II: Interim Evaluation – 2

No	Parameters	Marks	Poor	Fair	Very Good	Outstanding
2-f	Application of engineering knowledge [CO1] [Individual Assessment]	**10**	The student does not show any evidence of applying engineering knowledge on the design and the methodology adopted. The student's contribution in application of engineering knowledge in the project is poor.	The student appears to apply some basic knowledge, but not able to show the design procedure and the methodologies adopted in a comprehensive manner.	The student is able to show some evidence of application of engineering knowledge in the design and development of the project to good extent.	Excellent knowledge in design procedure and its adaptation. The student is able to apply knowledge from engineering domains to the problem and develop solutions.
			(0 – 3 Marks)	(4 – 6 Marks)	(7 - 9 Marks)	(10 Marks)
2-g	Involvement of individual members [CO3] [Individual Assessment]	**5**	No evidence of any Individual participation in the project work.	There is evidence for some amount of individual contribution, but is limited to some of the superficial tasks.	The individual contribution is evident. The student has good amount of involvement in core activities of the project.	Evidence available for the student acting as the core technical lead and has excellent contribution to the project.
			(0 - 1 Marks)	(2 - 3 Marks)	(4 Marks)	(5 Marks)
2-h	Results and inferences upon execution [CO5] [Group Assessment]	**5**	None of the expected outcomes are achieved yet. The team is unable to derive any inferences on the failures/ issues observed. Any kind o f observations or studies are not made.	Only a few of the expected outcomes are achieved. A few inferences are made on the observed failures/issues. No further work suggested.	Many of the expected outcomes are achieved. Many observations and inferences are made, and attempts to identify the issues are done. Some suggestions are made for further work.	Most of the stated outcomes are met. Extensive studies are done and inferences drawn. Most of the failures are addressed and solutions suggested. Clear and valid suggestions made for further work.
			(0 - 1 Marks)	(2 - 3 Marks)	(4 Marks)	(5 Marks)
2-i	Documentation and presentation. ·[CO6] [Individual assessment]	**5**	The individual student has no idea on the presentation of his/her part. The presentation is of poor quality.	Presentation's overall quality needs to be improved.	The individual's presentation performance is satisfactory.	The individual's presentation is done professionally and with great clarity. The individual's performance is excellent.
			(0 - 1 Marks)	(2 - 3 Marks)	(4 Marks)	(5 Marks)
Phase-II Interim Evaluation - 2 Total Marks: 25						

EVALUATION RUBRICS for PROJECT Phase II: Final Evaluation						
No	**Parameters**	**Marks**	**Poor**	**Fair**	**Very Good**	**Outstanding**
2-j	Engineering knowledge. [CO1] [Group Assessment]	10	The team does not show any evidence of applying engineering knowledge on the design and the methodology adopted.	The team is able to show some of the design procedure and the methodologies adopted, but not in a comprehensive manner.	The team is able to show evidence of application of engineering knowledge in the design and development of the project to good extent. There is scope for improvement.	Excellent knowledge in design procedure and its adaptation. The team is able to apply knowledge from engineering domains to the problem and develop an excellent solution.
			(0 – 3 Marks)	(4 – 6 Marks)	(7 - 9 Marks)	(10 Marks)
2-k	Relevance of the project with respect to societal and/or industrial needs. [Group Assessment] [CO2]	5	The project as a whole do not have any societal / industrial relevance at all.	The project has some relevance with respect to social and/or industrial application. The team has however made not much effort to explore further and make it better.	The project is relevant to the society and/or industry. The team is mostly successful in translating the problem into an engineering specification and managed to solve much of it.	The project is exceptionally relevant to society and/or industry. The team has made outstanding contribution while solving the problem in a professional and/ or ethical manner.
			(0 - 1 Marks)	(2 - 3 Marks)	(4 Marks)	(5 Marks)
2-i	Innovation / novelty / Creativity [CO5] [Group Assessment]	5	The project is not addressing any useful requirement. The idea is evolved into a non-implementable one. The work presented so far is lacking any amount of original work by the team.	Some of the aspects of the proposed idea appears to be practical. There is still lack of originality in the work done. The project is a regularly done theme/topic without any freshness in terms of specifications, features, and/ or improvements.	Good evidence of an implementable project. There is some evidence for the originality of the work done by the team. There is fresh specifications/ features/improvements suggested by the team. The team is doing a design from fundamental principles, and there is some independent learning and engineering ingenuity. Could be translated into a product / process if more work is done.	The project has evolved into incorporating an outstandingly novel idea. Original work which is not yet reported anywhere else. Evidence for ingenious way of innovation which is also Implementable. Could be a patentable publishable work.
			(0 - 1 Marks)	(2 - 3 Marks)	(4 Marks)	(5 Marks)
2-m	Quality of results / conclusions / solutions. [CO1] [Group Assessment]	10	None of the expected outcomes are achieved. The team is unable to derive any inferences on the failures/issues observed. Any kind of observations or studies is not made.	Only a few of the expected outcomes are achieved. A few inferences are made on the observed failures/issues. No further work suggested.	Many of the expected outcomes are achieved. Many observations and inferences are made, and attempts to identify the issues are done. Some suggestions are made for further work.	Most of the stated outcomes are met. Extensive studies are done and inferences drawn. Most of the failures are addressed and solutions suggested. Clear and valid suggestions made for further work.
			(0 – 3 Marks)	(4 – 6 Marks)	(7 - 9 Marks)	(10 Marks)

2-n	Presentation - Part I Preparation of slides. [CO6] [Group Assessment].	5	The presentation slides are shallow and in a clumsy format. It does not follow proper organization.	Presentation slides follow professional style formats to some extent. However, its organization is not very good. Language needs to be improved. All references are not cited properly, or acknowledged. Presentation slides needs to be more professional.	Presentation slides follow a good style format and there are only a few issues. Organization of the slides is good. Most of references are cited properly. The flow is good and team presentation is neatly organized. Some of the results are not clearly shown. There is room for improvement.	The presentation slides are exceptionally good. Neatly organized. All references cited properly. Diagrams/Figures, Tables and equations are properly numbered, and l i s ted. Results/ inferences clearly highlighted and readable.
			(0 - 1 Marks)	(2 - 3 Marks)	(4 Marks)	(5 Marks)
	Presentation - Part II: Individual Communication [CO6] [Individual Assessment].	5	The student is not communicating properly. Poor response to questions.	The student is able to explain some of the content. The student requires a lot of prompts to get to the idea. There are language issues.	Good presentation/ communication by the student. The student is able to explain most of the content very well. There are however, a few areas where the student shows lack of preparation. Language is better.	Clear and concise communication exhibited by the student. The presentation is outstanding. Very confident and tackles all the questions without hesitation. Exceptional traits of communicator.
			(0 - 1 Marks)	(2 - 3 Marks)	(4 Marks)	(5 Marks)
Phase-II Final Evaluation, Marks: 40						

EVALUATION RUBRICS for PROJECT Phase II: Report Evaluation						
Sl. No.	**Parameters**	**Marks**	**Poor**	**Fair**	**Very Good**	**Outstanding**
2-o	Report [CO6]	30	The prepared report is shallow and not as per standard format. It does not follow proper organization. Contains mostly unacknowledged content. Lack of effort in preparation is evident. References are not cited. Unprofessional and inconsistent formatting.	Project report follows the standard format to some extent. However, its organization is not very good. Language needs to be improved. All references are not cited properly in the report. There is lack of formatting consistency.	Project report shows evidence of systematic documentation. Report is mostly following the standard style format and there are only a few issues. Organization of the report is good. Mostly consistently formatted. Most of references/sources are cited/ acknowledged properly.	The report is exceptionally good. Neatly organized. All references cited properly. Diagrams/Figures, Tables and equations are properly numbered, and listed and clearly shown. Language is excellent and follows professional styles. Consistent formatting and exceptional readability.
			(0 - 11 Marks)	(12 - 18 Marks)	(19 - 28 Marks)	(29 - 30 Marks)
Phase - II Project Report Marks: 30						