

CET 286	Climate Change and Hazard Mitigation	Category	L	T	P	Credit	Year of Introduction
		VAC	4	0	0	4	2019

Preamble: The course is designed to build climate literacy among students, encourages them to adapt to climate change related issues. It helps learners to understand the fundamentals of climate, climate change and climate models, evaluate the impacts of climate change on ecosystems, and empower learners to take appropriate actions to adopt various hazard mitigation measures.

Pre-requisite: Nil

Course outcome

After the course, the student will able to:

CO1	Explain the basic physical principles of the global climate system.
CO2	Describe the large-scale climatic changes which has influenced the ecosystem.
CO3	List actions in key sectors to mitigate hazards due to climate change.
CO4	Identify international initiatives which support countries to address the climate change challenges.
CO5	Analyse the impact of climate change on ecosystem.

CET 256 Climate Change and Hazard Mitigation		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
	CO1	3					2	1							1	
	CO2	3					2	1								
	CO3	3					2	1								
	CO4	3					2									
	CO5	3					2	1								

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	15	15	30
Evaluate			
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 subdivisions and carry 14 marks.

Course Level Assessment

Qn No	Question	Marks	Course outcome (CO) Assessed
Part A			
1	Define climate system.	3	CO1
2	How does Albedo affect climate of a place?	3	CO1
3	Briefly explain El Nino and its effects.	3	CO2

4	What is carbon cycling?	3	CO2
5	Describe about General Circulation Models.	3	CO5
6	Comment on Ocean Acidification.	3	CO5
7	Discuss the mission of Intergovernmental Panel on Climate Change.	3	CO4
8	What is Montreal Protocol?	3	CO4
9	Briefly explain Carbon dioxide Capture and Storage.	3	CO3
10	Discuss the importance of bio energy crops.	3	CO3
Part B			
(Answer ANY ONE FULL question from each module)			
Module I			
11(a)	What is the general circulation of the atmosphere?	7	CO1
11(b)	How does the general circulation affect the earth's climate?	7	CO1
12(a)	What is the composition and structure of the atmosphere?	7	CO1
12(b)	Explain the significance of water in the atmosphere on climate of earth.	7	CO1
Module II			
13(a)	State and explain Global Warming Potential.	7	CO2
13(b)	Briefly explain Gandhian ideas on Global warming.	7	CO2
14(a)	Describe the importance of Greenhouse effect on global climate system.	7	CO2

14(b)	Discuss the role of carbon dioxide in Greenhouse effect	7	CO2
Module III			
15	Briefly explain the impact of climate change on surface temperature and precipitation.	14	CO5
16	Describe the different uncertainties inherent in the projection of climate.	14	CO5
Module IV			
17	Enumerate the international initiatives to address climate change challenges and explain any two.	14	CO4
18(a)	Outline the structure of the Intergovernmental Panel on Climate Change.	4	CO4
18(b)	Explain the comprehensive Assessment Reports of IPCC.	10	CO4
Module V			
19 (a)	Explain hazards due to climate change and describe the possible mitigation measures to it.	14	CO3
20 (a)	Discuss the concept of energy efficiency in buildings in response to climate change.	5	CO3
20 (b)	Discuss the impact of climate change on Ecosystem and its adaptation measures.	9	CO3

Model Question Paper

Reg No.:.....

QP CODE:.....

Name:.....

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

Course Code: CET 286

Climate Change and Hazard Mitigation

Max. Marks: 100

Duration: 3 hours

Part A

(Answer all questions; each question carries 3 marks)

1. Define climate system.
2. How does Albedo affect climate?
3. Briefly explain El Nino and its effects.
4. What is carbon cycling?
5. Describe about General Circulation Models.
6. Comment on Ocean Acidification.
7. Discuss the mission of Intergovernmental Panel on Climate Change.
8. What is Montreal Protocol?
9. Briefly explain Carbon dioxide Capture and Storage.
10. Discuss the importance of bio energy crops.

Part B

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

Module I

11. a) What is the general circulation of the atmosphere? (7 Marks)
b) How does the general circulation affect the earths climate? (7 Marks)

OR

12. a) What is the composition and structure of the atmosphere? (7 Marks)
b) Explain the significance of water in the atmosphere on climate of earth. (7 Marks)

Module II

13. (a) State and explain Global Warming Potential. (7 Marks)
b) Briefly explain Gandhian ideas on Global warming. (7 Marks)

OR

14. (a) Describe the importance of Greenhouse effect on global climate system. (7 Marks)
b) Discuss the role of carbon dioxide in Greenhouse effect. (7 Marks)

Module III

15. Explain the impact of climate change on surface temperature and precipitation. (14 Marks)

OR

16. Describe the different uncertainties inherent in the projection of climate. (14 Marks)

Module IV

17. Enumerate the international initiatives to address climate change challenges and explain any two. (14 Marks)

OR

18. a) Outline the structure of the Intergovernmental Panel on Climate Change. (4 Marks)
b) Explain the comprehensive Assessment Reports of IPCC. (10 Marks)

Module V

19. Explain hazards due to climate change and describe the possible mitigation measures to it. (14 Marks)

OR

20. (a) Discuss the concept of energy efficiency in buildings in response to climate change. (5 Marks)
b) Discuss the impact of climate change on Ecosystem and its adaptation measures. (9 Marks)

Course Code: CET 286
Climate Change and Hazard Mitigation

Module I

Introduction to Earth's Climate System: Basic concepts- Radiation, Albedo, Emissivity, scales of motion, large-scale motion, general circulation, troposphere-stratosphere transport. Atmospheric structure and thermodynamics: pressure, density, composition, temperature structure, water in the atmosphere. Atmospheric photochemistry and chemical kinetics

Module II

Hurricanes and Global warming: Global Ocean Circulation - El Nino and its effects - Paleo- indicators of climate -The Nature of Storms—cyclones, tornadoes and hurricanes. Greenhouse effect-greenhouse gases-sources of emission - The Role of Carbon Dioxide, The Earth's Carbon Reservoirs, Carbon Cycling-Climate and Weather Global warming potential - Effects of Global warming- Gandhian ideas on global warming.

Module III

Climate data and Models: Equations of atmospheric fluid mechanics, energy equation, turbulence, mixing length models, Atmospheric chemical transport and general circulation models. Analyses of climate data. Climate projections and their uncertainties. Impacts of climate change on Surface temperature, Precipitation, Ocean pH, Sea-level and Arctic sea-ice extent.

Module IV

International initiatives to address the climate change challenges: History of Earth's climate – 1970s (IIASA, DOE), 1980s, Startup of the U.N IPCC, Mission of the IPCC, The Framework Convention on Climate Change, The Kyoto Protocol to the Framework Convention, Earth Summit, Montreal Protocol. Policy Analyses, Internationally Adopted Emissions Restrictions.

Module V

Climate Change Adaptation & Mitigation Measures: Adaptation to climate change in the fields of Ecosystems and biodiversity - Agriculture and food security, land use, forestry, human health, water supply, sanitation and infrastructure. Hazards due to climate change

and Mitigation Measures: Extreme weather events. Mitigation measures in sectors vital to humanity (food, water, health): Brief explanation of - Carbon dioxide capture and storage (CCS), Bio-energy crops, Energy efficiency in buildings.

Text Books

- Mark Masli, Climate Change: A Very Short Introduction, Oxford University Press, 2014.
- Jan C van Dam, Impacts of Climate Change and Climate Variability on Hydrological Regimes, Cambridge University Press, UK, 2003.
- Trenberth, K.E. (Editor), 1992: *Climate System Modeling*, Cambridge University Press, Cambridge, U.K.

References

- IPCC second assessment report - Working Group I Report, The Science of climate change, 1995.
- IPCC fourth assessment report - The AR4 synthesis report, 2007
- IPCC fourth assessment report - Working Group I Report, The physical Science Basis, 2007.
- IPCC fourth assessment report - Working Group II Report, Impacts, Adaptation and Vulnerability, 2007.
- IPCC fourth assessment report - Working Group III Report Mitigation of Climate change, 2007
- IPCC fifth assessment report - The AR5 synthesis report, 2014

Course Code: CET 286
Climate Change and Hazard Mitigation
Course content and Schedule of Lecture (sample)

Module	Topic	Course outcome addressed	No of Hours
Module I (9 Hours)			
1.1	Introduction to Earth's Climate System: Basic concepts	CO1	1
1.2	Radiation, Albedo, Emissivity,	CO1	1
1.3	Scales of motion, large-scale motion	CO1	1
1.4	General circulation, troposphere-stratosphere transport	CO1	1
1.5	Atmospheric structure and thermodynamics	CO1	1
1.6	Pressure, density, composition	CO1	1

1.7	Temperature structure, water in the atmosphere	CO1	1
1.8	Atmospheric photochemistry	CO1	1
1.9	Chemical kinetics	CO1	1
Module II (9 Hours)			
2.1	Hurricanes and Global warming: Global Ocean Circulation	CO2	1
2.2	El Nino and its effects - Paleo- indicators of climate	CO2	1
2.3	The Nature of Storms—cyclones, tornadoes and hurricanes	CO2	1
2.4	Greenhouse effect-greenhouse gases-sources of emission	CO2	1
2.5	The Role of Carbon Dioxide, The Earth's Carbon Reservoirs	CO2	1
2.6	Carbon Cycling-Climate and Weather Global warming potential	CO2	1
2.7	Effects of Global warming	CO2	1
2.8	Effects of Global warming	CO2	1
2.9	Gandhian ideas on global warming.	CO2	1

Module III (9 Hours)			
3.1	Climate data and Models; Equations of atmospheric fluid mechanics, energy equation, turbulence	CO5	1
3.2	Mixing length models	CO5	1
3.3	Atmospheric chemical transport	CO5	1
3.4	General circulation models	CO5	1
3.5	Analyses of climate data	CO5	1
3.6	Climate projections and their uncertainties	CO5	1
3.7	Impacts of climate change on Surface temperature, Precipitation	CO5	1
3.8	Impacts of climate change on Ocean pH, Sea-level and Arctic sea-ice extent	CO5	1

3.9	Impacts of climate change on Ocean pH, Sea-level and Arctic sea-ice extent	CO5	1
Module IV (9 Hours)			
4.1	International initiatives to address the climate change challenges	CO4	1
4.2	History of Earth's climate – 1970s (IIASA, DOE), 1980s	CO4	1
4.3	Startup of the U.N IPCC, Mission of the IPCC	CO4	1
4.4	The Framework Convention on Climate Change	CO4	1
4.5	The Kyoto Protocol to the Framework Convention	CO4	1
4.6	Earth Summit	CO4	1
4.7	Montreal Protocol	CO4	1
4.8	Policy Analyses	CO4	1
4.9	Internationally Adopted Emissions Restrictions	CO4	1

Module V (9 Hours)			
5.1	Climate Change Adaptation & Mitigation Measures	CO3	1
5.2	Adaptation to climate change in the fields of Ecosystems and biodiversity	CO3	1
5.3	Agriculture and food security, land use, forestry, human health	CO3	1
5.4	Water supply, sanitation and infrastructure	CO3	1
5.5	Hazards due to climate change and Mitigation Measures: Extreme weather events	CO3	1
5.6	Mitigation measures in sectors vital to humanity (food, water, health)	CO3	1
5.7	Carbon dioxide capture and storage (CCS)	CO3	1
5.8	Bio-energy crops, Energy efficiency in buildings.	CO3	1
5.9	Energy efficiency in buildings.	CO3	1

CODE MCN202	COURSE NAME CONSTITUTION OF INDIA	CATEGORY	L	T	P	CREDIT
			2	0	0	NIL

Preamble:

The study of their own country constitution and studying the importance environment as well as understanding their own human rights help the students to concentrate on their day to day discipline. It also gives the knowledge and strength to face the society and people.

Prerequisite: Nil

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

CO 1	Explain the background of the present constitution of India and features.
CO 2	Utilize the fundamental rights and duties.
CO 3	Understand the working of the union executive, parliament and judiciary.
CO 4	Understand the working of the state executive, legislature and judiciary.
CO 5	Utilize the special provisions and statutory institutions.
CO 6	Show national and patriotic spirit as responsible citizens of the country

Mapping of course outcomes with program outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1						2	2	2		2		
CO 2						3	3	3		3		
CO 3						3	2	3		3		
CO 4						3	2	3		3		
CO 5						3	2	3		3		
CO 6						3	3	3		2		

Assessment Pattern

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

Evaluate			
Create			

Mark distribution

Total Marks	CIE	ESE	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: 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**Course Outcome 1 (CO1):**

- 1 Discuss the historical background of the Indian constitution.
- 2 Explain the salient features of the Indian constitution.
- 3 Discuss the importance of preamble in the implementation of constitution.

Course Outcome 2 (CO2)

- 1 What are fundamental rights ? Examine each of them.
- 2 Examine the scope of freedom of speech and expression underlying the constitution.
- 3 The thumb impression of an accused is taken by the police against his will. He contends that this is a violation of his rights under Art 20(3) of the constitution. Decide.

Course Outcome 3(CO3):

- 1 Explain the powers of the President to suspend the fundamental rights during emergency.

- 2 Explain the salient features of appeal by special leave.
3. List the constitutional powers of President.

Course Outcome 4 (CO4):

- 1 Discuss the constitutional powers of Governor.
- 2 Examine the writ jurisdiction of High court.
- 3 Discuss the qualification and disqualification of membership of state legislature.

Course Outcome 5 (CO5):

- 1 Discuss the duties and powers of comptroller of auditor general.
- 2 Discuss the proclamation of emergency.
- 3 A state levies tax on motor vehicles used in the state, for the purpose of maintaining roads in the state. X challenges the levy of the tax on the ground that it violates the freedom of interstate commerce guaranteed under Art 301. Decide.

Course Outcome 6 (CO6):

- 1 Explain the advantages of citizenship.
- 2 List the important principles contained in the directive principles of state policy.
- 3 Discuss the various aspects contained in the preamble of the constitution

Model Question paper**PART A**

(Answer all questions. Each question carries 3 marks)

- 1 Define and explain the term constitution.
- 2 Explain the need and importance of Preamble.
- 3 What is directive principle of state policy?
- 4 Define the State.
- 5 List the functions of Attorney general of India.

- 6 Explain the review power of Supreme court.
- 7 List the qualifications of Governor.
- 8 Explain the term and removal of Judges in High court.
- 9 Explain the powers of public service commission.
- 10 List three types of emergency under Indian constitution.

(10X3=30marks)

PART B

(Answer on question from each module. Each question carries 14 marks)

Module 1

- 11 Discuss the various methods of acquiring Indian citizenship.
- 12 Examine the salient features of the Indian constitution.

Module 2

- 13 A high court passes a judgement against X. X desires to file a writ petition in the supreme court under Art32, on the ground that the judgement violates his fundamental rights. Advise him whether he can do so.
- 14 What is meant by directive principles of State policy? List the directives.

Module3

- 15 Describe the procedure of election and removal of the President of India.
- 16 Supreme court may in its discretion grant special leave to appeal. Examine the situation.

Module 4

- 17 Discuss the powers of Governor.
- 18 X filed a writ petition under Art 226 which was dismissed. Subsequently, he filed a writ petition under Art 32 of the constitution, seeking the same remedy. The Government argued that the writ petition should be dismissed, on the ground of res judicata. Decide.

Module 5

19 Examine the scope of the financial relations between the union and the states.

20 Discuss the effects of proclamation of emergency.

(14X5=70marks)

Syllabus

Module 1 Definition, historical back ground, features, preamble, territory, citizenship.

Module 2 State, fundamental rights, directive principles, duties.

Module 3 The machinery of the union government.

Module 4 Government machinery in the states

Module 5 The federal system, Statutory Institutions, miscellaneous provisions.

Text Books

1 D D Basu, Introduction to the constitution of India, Lexis Nexis, New Delhi, 24e, 2019

2 PM Bhakshi, The constitution of India, Universal Law, 14e, 2017

Reference Books

1 Ministry of law and justice, The constitution of India, Govt of India, New Delhi, 2019.

2 JN Pandey, The constitutional law of India, Central Law agency, Allahabad, 51e, 2019

3 MV Pylee, India's Constitution, S Chand and company, New Delhi, 16e, 2016

Course Contents and Lecture Schedule

No	Topic	No. of Lectures
1	Module 1	
1.1	Definition of constitution, historical back ground, salient features of the constitution.	1
1.2	Preamble of the constitution, union and its territory.	1
1.3	Meaning of citizenship, types, termination of citizenship.	2
2	Module 2	
2.1	Definition of state, fundamental rights, general nature, classification, right to equality ,right to freedom , right against exploitation	2

2.2	Right to freedom of religion, cultural and educational rights, right to constitutional remedies. Protection in respect of conviction for offences.	2
2.3	Directive principles of state policy, classification of directives, fundamental duties.	2
3	Module 3	
3.1	The Union executive, the President, the vice President, the council of ministers, the Prime minister, Attorney-General, functions.	2
3.2	The parliament, composition, Rajya sabha, Lok sabha, qualification and disqualification of membership, functions of parliament.	2
3.3	Union judiciary, the supreme court, jurisdiction, appeal by special leave.	1
4	Module 4	
4.1	The State executive, the Governor, the council of ministers, the Chief minister, advocate general, union Territories.	2
4.2	The State Legislature, composition, qualification and disqualification of membership, functions.	2
4.3	The state judiciary, the high court, jurisdiction, writs jurisdiction.	1
5	Module 5	
5.1	Relations between the Union and the States, legislative relation, administrative relation, financial Relations, Inter State council, finance commission.	1
5.2	Emergency provision, freedom of trade commerce and inter course, comptroller and auditor general of India, public Services, public service commission, administrative Tribunals.	2
5.3	Official language, elections, special provisions relating to certain classes, amendment of the Constitution.	2

CODE	COURSE NAME	CATEGORY	L	T	P	CREDIT
				2	0	0
EST 200	DESIGN AND ENGINEERING					

Preamble:

The purpose of this course is to

- i) introduce the undergraduate engineering students the fundamental principles of design engineering,
- ii) make them understand the steps involved in the design process and
- iii) familiarize them with the basic tools used and approaches in design.

Students are expected to apply design thinking in learning as well as while practicing engineering, which is very important and relevant for today. Case studies from various practical situations will help the students realize that design is not only concerned about the function but also many other factors like customer requirements, economics, reliability, etc. along with a variety of life cycle issues.

The course will help students to consider aesthetics, ergonomics and sustainability factors in designs and also to practice professional ethics while designing.

Prerequisite:

Nil. The course will be generic to all engineering disciplines and will not require specialized preparation or prerequisites in any of the individual engineering disciplines.

Course Outcomes:

After the completion of the course the student will be able to

CO 1	Explain the different concepts and principles involved in design engineering.
CO 2	Apply design thinking while learning and practicing engineering.
CO 3	Develop innovative, reliable, sustainable and economically viable designs incorporating knowledge in engineering.

Mapping of course outcomes with program outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	2	1					1			1		
CO 2		2				1		1				2
CO 3			2			1	1		2	2		1

Assessment Pattern**Continuous Internal Evaluation (CIE) Pattern:**

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

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

Part A : 30 marks

part B : 70 marks

Part A contains 10 questions with 2 questions from each module, having 3 marks for each question. Students should answer all questions.

Part B contains 2 case study questions from each module of which student should answer any one. Each question carry 14 marks and can have maximum 2 sub questions.

Mark distribution

Total Marks	CIE	ESE	ESE Duration
150	50	100	3 hours

Bloom's Category	Continuous Assessment Tests		End Semester Examination
	1	2	
Remember	5	5	10
Understand	10	10	20
Apply	35	35	70
Analyse	-	-	-
Evaluate	-	-	-
Create	-	-	-

Course Level Assessment Questions

Course Outcome 1 (CO1): Appreciate the different concepts and principles involved in design engineering.

1. State how engineering design is different from other kinds of design
2. List the different stages in a design process.
3. Describe design thinking.
4. State the function of prototyping and proofing in engineering design.
5. Write notes on the following concepts in connection with design engineering 1) Modular Design, 2) Life Cycle Design , 3) Value Engineering, 4) Concurrent Engineering, and 5) Reverse Engineering
6. State design rights.

Course Outcome 2 (CO2) Apply design thinking while learning and practicing engineering.

1. Construct the iterative process for design thinking in developing simple products like a pen, umbrella, bag, etc.
2. Show with an example how divergent-convergent thinking helps in generating alternative designs and then how to narrow down to the best design.
3. Describe how a problem-based learning helps in creating better design engineering solutions.
4. Discuss as an engineer, how ethics play a decisive role in your designs

Course Outcome 3 (CO3): Develop innovative, reliable, sustainable and economically viable designs incorporating different segments of knowledge in engineering.

1. Illustrate the development of any simple product by passing through the different stages of design process
2. Show the graphical design communication with the help of detailed 2D or 3D drawings for any simple product.
3. Describe how to develop new designs for simple products through bio-mimicry.

Model Question paper

Page 1 of 2

Reg No.: _____ Name: _____

**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
THIRD/FOURTH SEMESTER B.TECH DEGREE EXAMINATION**

Course Code: EST 200

Course Name: DESIGN AND ENGINEERING

Max. Marks: 100 Duration: 3 Hours

PART A**Answer all questions, each question carries 3 marks****Use only hand sketches**

- (1) Write about the basic design process.
- (2) Describe how to finalize the design objectives.
- (3) State the role of divergent-convergent questioning in design thinking.
- (4) Discuss how to perform design thinking in a team managing the conflicts.
- (5) Show how engineering sketches and drawings convey designs.
- (6) Explain the role of mathematics and physics in design engineering process.
- (7) Distinguish between project-based learning and problem-based learning in design engineering.
- (8) Describe how concepts like value engineering, concurrent engineering and reverse engineering influence engineering designs?
- (9) Show how designs are varied based on the aspects of production methods, life span, reliability and environment?
- (10) Explain how economics influence the engineering designs?

(10x3 marks =30 marks)**Part B****Answer any ONE question from each module. Each question carry 14 marks****Module 1**

- (11) Show the designing of a wrist watch going through the various stages of the design process. Use hand sketches to illustrate the processes.
- or**
- (12) Find the customer requirements for designing a new car showroom. Show how the design objectives were finalized considering the design constraints?

Module 2

(13) Illustrate the design thinking approach for designing a bag for college students within a limited budget. Describe each stage of the process and the iterative procedure involved. Use hand sketches to support your arguments.

or

(14) Construct a number of possible designs and then refine them to narrow down to the best design for a drug trolley used in hospitals. Show how the divergent-convergent thinking helps in the process. Provide your rationale for each step by using hand sketches only.

Module 3

(15) Graphically communicate the design of a thermo flask used to keep hot coffee. Draw the detailed 2D drawings of the same with design detailing, material selection, scale drawings, dimensions, tolerances, etc. Use only hand sketches.

or

(16) Describe the role of mathematical modelling in design engineering. Show how mathematics and physics play a role in designing a lifting mechanism to raise 100 kg of weight to a floor at a height of 10 meters in a construction site.

Module 4

(17) Show the development of a nature inspired design for a solar powered bus waiting shed beside a highway. Relate between natural and man-made designs. Use hand sketches to support your arguments.

or

(18) Show the design of a simple sofa and then depict how the design changes when considering 1) aesthetics and 2) ergonomics into consideration. Give hand sketches and explanations to justify the changes in designs.

Module 5

(19) Examine the changes in the design of a foot wear with constraints of 1) production methods, 2) life span requirement, 3) reliability issues and 4) environmental factors. Use hand sketches and give proper rationalization for the changes in design.

or

(20) Describe the how to estimate the cost of a particular design using ANY of the following:
i) a website, ii) the layout of a plant, iii) the elevation of a building, iv) an electrical or electronic system or device and v) a car.

Show how economics will influence the engineering designs. Use hand sketches to support your arguments.

(5x14 marks =70 marks)

Syllabus

Module 1

Design Process:- Introduction to Design and Engineering Design, Defining a Design Process:-Detailing Customer Requirements, Setting Design Objectives, Identifying Constraints, Establishing Functions, Generating Design Alternatives and Choosing a Design.

Module 2

Design Thinking Approach:-Introduction to Design Thinking, Iterative Design Thinking Process Stages: Empathize, Define, Ideate, Prototype and Test. Design Thinking as Divergent-Convergent Questioning. Design Thinking in a Team Environment.

Module 3

Design Communication (Languages of Engineering Design):-Communicating Designs Graphically, Communicating Designs Orally and in Writing. Mathematical Modeling In Design, Prototyping and Proofing the Design.

Module 4

Design Engineering Concepts:-Project-based Learning and Problem-based Learning in Design.Modular Design and Life Cycle Design Approaches. Application of Biomimicry,Aesthetics and Ergonomics in Design. Value Engineering, Concurrent Engineering, and Reverse Engineering in Design.

Module 5

Expediency, Economics and Environment in Design Engineering:-Design for Production, Use, and Sustainability. Engineering Economics in Design. Design Rights. Ethics in Design

Text Books

- 1) YousefHaik, SangarappillaiSivaloganathan, Tamer M. Shahin, Engineering Design Process, Cengage Learning 2003, Third Edition, ISBN-10: 9781305253285,
- 2) Voland, G., Engineering by Design, Pearson India 2014, Second Edition, ISBN 9332535051

Reference Books

- 1.Philip Kosky, Robert Balmer, William Keat, George Wise, Exploring Engineering, Fourth Edition: An Introduction to Engineering and Design, Academic Press 2015, 4th Edition, ISBN: 9780128012420.
2. Clive L. Dym, Engineering Design: A Project-Based Introduction, John Wiley & Sons, New York 2009, Fourth Edition, ISBN: 978-1-118-32458-5
3. Nigel Cross, Design Thinking: Understanding How Designers Think and Work, Berg Publishers 2011, First Edition, ISBN: 978-1847886361
4. Pahl, G., Beitz, W., Feldhusen, J., Grote, K.-H., Engineering Design: A Systematic Approach, Springer 2007, Third Edition, ISBN 978-1-84628-319-2

Course Contents and Lecture Schedule

No	Topic	No. of Lectures
1	<u>Module 1: Design Process</u>	
1.1	Introduction to Design and Engineering Design. <i>What does it mean to design something? How Is engineering design different from other kinds of design? Where and when do engineers design? What are the basic vocabulary in engineering design? How to learn and do engineering design.</i>	1
1.2	<i>Defining a Design Process-</i> : Detailing Customer Requirements. <i>How to do engineering design? Illustrate the process with an example. How to identify the customer requirements of design?</i>	1
1.3	<i>Defining a Design Process-</i> : Setting Design Objectives, Identifying Constraints, Establishing Functions. <i>How to finalize the design objectives? How to identify the design constraints? How to express the functions a design in engineering terms?</i>	1
1.4	<i>Defining a Design Process-</i> : Generating Design Alternatives and Choosing a Design. <i>How to generate or create feasible design alternatives? How to identify the "best possible design"?</i>	1
1.5	Case Studies:- Stages of Design Process. <i>Conduct exercises for designing simple products going through the different stages of design process.</i>	1
2	<u>Module 2: Design Thinking Approach</u>	
2.1	Introduction to Design Thinking <i>How does the design thinking approach help engineers in creating innovative and efficient designs?</i>	1
2.2	Iterative Design Thinking Process Stages: Empathize, Define, Ideate, Prototype and Test. <i>How can the engineers arrive at better designs utilizing the iterative design thinking process (in which knowledge acquired in the later stages can be applied back to the earlier stages)?</i>	1
2.3	Design Thinking as Divergent-Convergent Questioning. <i>Describe how to create a number of possible designs and then how to refine and narrow down to the 'best design'.</i>	1
2.4	Design Thinking in a Team Environment. <i>How to perform design thinking as a team managing the conflicts ?</i>	1
2.5	Case Studies: Design Thinking Approach. <i>Conduct exercises using the design thinking approach for</i>	1

	<i>designing any simple products within a limited time and budget</i>	
3	<u>Module 3: Design Communication (Languages of Engineering Design)</u>	
3.1	Communicating Designs Graphically. <i>How do engineering sketches and drawings convey designs?</i>	1
3.2	Communicating Designs Orally and in Writing. <i>How can a design be communicated through oral presentation or technical reports efficiently?</i>	1
First Series Examination		
3.3	Mathematical Modelling in Design. <i>How do mathematics and physics become a part of the design process?</i>	1
3.4	Prototyping and Proofing the Design. <i>How to predict whether the design will function well or not?</i>	1
3.5	Case Studies: Communicating Designs Graphically. <i>Conduct exercises for design communication through detailed 2D or 3D drawings of simple products with design detailing, material selection, scale drawings, dimensions, tolerances, etc.</i>	1
4	<u>Module 4: Design Engineering Concepts</u>	
4.1	Project-based Learning and Problem-based Learning in Design. <i>How engineering students can learn design engineering through projects?</i> <i>How students can take up problems to learn design engineering?</i>	1
4.2	Modular Design and Life Cycle Design Approaches. <i>What is modular approach in design engineering? How it helps?</i> <i>How the life cycle design approach influences design decisions?</i>	1
4.3	Application of Bio-mimicry, Aesthetics and Ergonomics in Design. <i>How do aesthetics and ergonomics change engineering designs?</i> <i>How do the intelligence in nature inspire engineering designs? What are the common examples of bio-mimicry in engineering?</i>	1
4.4	Value Engineering, Concurrent Engineering, and Reverse Engineering in Design. <i>How do concepts like value engineering , concurrent engineering and reverse engineering influence engineering designs?</i>	1
4.5	Case Studies: Bio-mimicry based Designs. <i>Conduct exercises to develop new designs for simple</i>	1

	<i>products using bio-mimicry and train students to bring out new nature inspired designs.</i>	
5	<u>Module 5: Expediency, Economics and Environment in Design Engineering</u>	
5.1	Design for Production, Use, and Sustainability. <i>How designs are finalized based on the aspects of production methods, life span, reliability and environment?</i>	1
5.2	Engineering Economics in Design. <i>How to estimate the cost of a particular design and how will economics influence the engineering designs?</i>	1
5.3	Design Rights. <i>What are design rights and how can an engineer put it into practice?</i>	1
5.4	Ethics in Design. <i>How do ethics play a decisive role in engineering design?</i>	1
5.5	Case Studies: Design for Production, Use, and Sustainability. <i>Conduct exercises using simple products to show how designs change with constraints of production methods, life span requirement, reliability issues and environmental factors.</i>	1
Second Series Examination		

MCN	DISASTER MANAGEMENT	Category	L	T	P	CREDIT	YEAR OF INTRODUCTION
301		Non - Credit	2	0	0	Nil	2019

Preamble: The objective of this course is to introduce the fundamental concepts of hazards and disaster management.

Prerequisite: Nil

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

CO1	Define and use various terminologies in use in disaster management parlance and organise each of these terms in relation to the disaster management cycle (Cognitive knowledge level: Understand).
CO2	Distinguish between different hazard types and vulnerability types and do vulnerability assessment (Cognitive knowledge level: Understand).
CO3	Identify the components and describe the process of risk assessment, and apply appropriate methodologies to assess risk (Cognitive knowledge level: Understand).
CO4	Explain the core elements and phases of Disaster Risk Management and develop possible measures to reduce disaster risks across sector and community (Cognitive knowledge level: Apply)
CO5	Identify factors that determine the nature of disaster response and discuss the various disaster response actions (Cognitive knowledge level: Understand).
CO6	Explain the various legislations and best practices for disaster management and risk reduction at national and international level (Cognitive knowledge level: Understand).

Mapping of course outcomes with program outcomes

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

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	PO10	Communication
PO5	Modern tool usage	PO11	Project Management and Finance
PO6	The Engineer and Society	PO12	Life long learning

Assessment Pattern

Bloom's Category	Continuous Assessment Tests		End Semester Examination Marks
	Test 1 (Marks)	Test 2 (Marks)	
Remember	10	10	20
Understand	25	25	50
Apply	15	15	30
Analyze			
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 : 25 marks

Continuous Assessment - Assignment : 15 marks

Internal Examination Pattern:

Each of the two internal examinations has to be conducted out of 50 marks. First series test shall be preferably conducted after completing the first half of the syllabus and the second series test shall be preferably conducted after completing remaining part of the syllabus. There will be two parts: Part A and Part B. Part A contains 5 questions (preferably, 2 questions each from the completed modules and 1 question from the partly completed module), having 3 marks for each question adding up to 15 marks for part A. Students should answer all questions from Part A.

Part B contains 7 questions (preferably, 3 questions each from the completed modules and 1 question from the partly completed module), each with 7 marks. Out of the 7 questions, a student should answer any 5.

End Semester Examination Pattern:

There will be two parts; Part A and Part B. Part A contains 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 a student should answer any one. Each question can have maximum 2 sub-divisions and carries 14 marks.

SYLLABUS

MCN 301 Disaster Management

Module 1

Systems of earth

Lithosphere- composition, rocks, soils; Atmosphere-layers, ozone layer, greenhouse effect, weather, cyclones, atmospheric circulations, Indian Monsoon; hydrosphere- Oceans, inland water bodies; biosphere

Definition and meaning of key terms in Disaster Risk Reduction and Management- disaster, hazard, exposure, vulnerability, risk, risk assessment, risk mapping, capacity, resilience, disaster risk reduction, disaster risk management, early warning systems, disaster preparedness, disaster prevention, disaster mitigation, disaster response, damage assessment, crisis counselling, needs assessment.

Module 2

Hazard types and hazard mapping; Vulnerability types and their assessment- physical, social, economic and environmental vulnerability.

Disaster risk assessment –approaches, procedures

Module 3

Disaster risk management -Core elements and phases of Disaster Risk Management

Measures for Disaster Risk Reduction – prevention, mitigation, and preparedness.

Disaster response- objectives, requirements; response planning; types of responses.

Relief; international relief organizations.

Module 4

Participatory stakeholder engagement; Disaster communication- importance, methods, barriers; Crisis counselling

Capacity Building: Concept – Structural and Non-structural Measures, Capacity Assessment; Strengthening Capacity for Reducing Risk

Module 5

Common disaster types in India; Legislations in India on disaster management; National disaster management policy; Institutional arrangements for disaster management in India.

The Sendai Framework for Disaster Risk Reduction- targets, priorities for action, guiding principles

Reference Text Book

1. R. Subramanian, Disaster Management, Vikas Publishing House, 2018
2. M. M. Sulphery, Disaster Management, PHI Learning, 2016
3. UNDP, Disaster Risk Management Training Manual, 2016
4. United Nations Office for Disaster Risk Reduction, Sendai Framework for Disaster Risk Reduction 2015-2030, 2015

Sample Course Level Assessment Questions

Course Outcome 1 (CO1):

1. What is the mechanism by which stratospheric ozone protects earth from harmful UV rays?
2. What are disasters? What are their causes?
3. Explain the different types of cyclones and the mechanism of their formation
4. Explain with examples, the difference between hazard and risk in the context of disaster management
5. Explain the following terms in the context of disaster management (a) exposure (b) resilience (c) disaster risk management (d) early warning systems, (e) damage assessment (f) crisis counselling (g) needs assessment

Course Outcome 2 (CO2):

1. What is hazard mapping? What are its objectives?
2. What is participatory hazard mapping? How is it conducted? What are its advantages?
3. Explain the applications of hazard maps
4. Explain the types of vulnerabilities and the approaches to assess them

Course Outcome 3 (CO3):

1. Explain briefly the concept of 'disaster risk'

2. List the strategies for disaster risk management ‘before’, ‘during’ and ‘after’ a disaster
3. What is disaster preparedness? Explain the components of a comprehensive disaster preparedness strategy

Course Outcome 4 (CO4):

1. What is disaster prevention? Distinguish it from disaster mitigation giving examples
2. What are the steps to effective disaster communication? What are the barriers to communication?
3. Explain capacity building in the context of disaster management

Course Outcome 5 (CO5):

1. Briefly explain the levels of stakeholder participation in the context of disaster risk reduction
2. Explain the importance of communication in disaster management
3. Explain the benefits and costs of stakeholder participation in disaster management
4. How are stakeholders in disaster management identified?

Course Outcome 6 (CO6):

1. Explain the salient features of the National Policy on Disaster Management in India
2. Explain the guiding principles and priorities of action according to the Sendai Framework for Disaster Risk Reduction
3. What are Tsunamis? How are they caused?
4. Explain the earthquake zonation of India

Model Question paper

QP CODE:

PAGES:3

Reg No:_____

Name :_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

FIFTH SEMESTER B.TECH DEGREE EXAMINATION, MONTH & YEAR

Course Code: MCN 301

Course Name: Disaster Management

Max.Marks:100

Duration: 3 Hours

PART A

Answer all Questions. Each question carries 3 Marks

1. What is the mechanism by which stratospheric ozone protects earth from harmful UV rays?
2. What are disasters? What are their causes?
3. What is hazard mapping? What are its objectives?
4. Explain briefly the concept of 'disaster risk'
5. List the strategies for disaster risk management 'before', 'during' and 'after' a disaster
6. What is disaster prevention? Distinguish it from disaster mitigation giving examples
7. Briefly explain the levels of stakeholder participation in the context of disaster risk reduction
8. Explain the importance of communication in disaster management
9. What are Tsunamis? How are they caused?
10. Explain the earthquake zonation of India

Part B

Answer any one Question from each module. Each question carries 14 Marks

11. a. Explain the different types of cyclones and the mechanism of their formation [10]
b. Explain with examples, the difference between hazard and risk in the context of disaster management [4]

OR

12. Explain the following terms in the context of disaster management [14]
(a) exposure (b) resilience (c) disaster risk management (d) early warning systems, (e) damage assessment (f) crisis counselling (g) needs assessment

13. a. What is participatory hazard mapping? How is it conducted? What are its advantages? [8]
b. Explain the applications of hazard maps [6]

OR

14. Explain the types of vulnerabilities and the approaches to assess them [14]
15. a. Explain the core elements of disaster risk management [8]
b. Explain the factors that decide the nature of disaster response [6]

OR

16. a. What is disaster preparedness? Explain the components of a comprehensive disaster preparedness strategy [6]
b. Explain the different disaster response actions [8]
17. a. Explain the benefits and costs of stakeholder participation in disaster management [10]
b. How are stakeholders in disaster management identified? [4]

OR

18. a. What are the steps to effective disaster communication? What are the barriers to communication? [7]
b. Explain capacity building in the context of disaster management [7]

19. Explain the salient features of the National Policy on Disaster Management in India

[14]

OR

20. Explain the guiding principles and priorities of action according to the Sendai Framework for Disaster Risk Reduction

[14]

Teaching Plan

	Module 1	5 Hours
1.1	Introduction about various Systems of earth, Lithosphere-composition, rocks, Soils; Atmosphere-layers, ozone layer, greenhouse effect, weather	1 Hour
1.2	Cyclones, atmospheric circulations, Indian Monsoon; hydrosphere-Oceans, inland water bodies; biosphere	1 Hour
1.3	Definition and meaning of key terms in Disaster Risk Reduction and Management- disaster, hazard,	1 Hour
1.4	Exposure, vulnerability, risk, risk assessment, risk mapping, capacity, resilience, disaster risk reduction, Disaster risk management, early warning systems	1 Hour
1.5	Disaster preparedness, disaster prevention, disaster, Mitigation, disaster response, damage assessment, crisis counselling, needs assessment.	1 Hour
	Module 2	5 Hours
2.1	Various Hazard types, Hazard mapping; Different types of Vulnerability types and their assessment	1 Hour
2.2	Vulnerability assessment and types, Physical and social vulnerability	1 Hour
2.3	Economic and environmental vulnerability, Core elements of disaster risk assessment	1 Hour
2.4	Components of a comprehensive disaster preparedness strategy approaches, procedures	1 Hour
2.5	Different disaster response actions	1 Hour
	Module 3	5 Hours
3.1	Introduction to Disaster risk management, Core elements of Disaster Risk Management	1 Hour
3.2	Phases of Disaster Risk Management, Measures for Disaster Risk Reduction	1 Hour
3.3	Measures for Disaster prevention, mitigation, and preparedness.	1 Hour

3.4	Disaster response- objectives, requirements. Disaster response planning; types of responses.	1 Hour
3.5	Introduction- Disaster Relief, Relief; international relief organizations.	1 Hour
	Module 4	5 Hours
4.1	Participatory stakeholder engagement	1 Hour
4.2	Importance of disaster communication.	1 Hour
4.3	Disaster communication- methods, barriers. Crisis counselling	1 Hour
4.4	Introduction to Capacity Building. Concept – Structural Measures, Non-structural Measures.	1 Hour
4.5	Introduction to Capacity Assessment, Capacity Assessment; Strengthening, Capacity for Reducing Risk	1 Hour
	Module 5	5 Hours
5.1	Introduction-Common disaster types in India.	1 Hour
5.2	Common disaster legislations in India on disaster management	1 Hour
5.3	National disaster management policy, Institutional arrangements for disaster management in India.	1 Hour
5.4	The Sendai Framework for Disaster Risk Reduction and targets	1 Hour
5.5	The Sendai Framework for Disaster Risk Reduction-priorities for action, guiding principles	1 Hour

CET383	ECO-FRIENDLY TRANSPORTATION SYSTEMS	CATEGORY	L	T	P	CREDIT	YEAR OF INTRODUCTION
		VAC	3	1	0	4	2019

Preamble : Objective of the course is to introduce the principles and practice of sustainability on transportation systems and development of an eco-friendly transport system.

Prerequisite: Nil

Course Outcomes:

	Description
CO No.	At the end of the course, students will be able to:
CO 1	Apply the basic principles of sustainability to infrastructure related problems
CO 2	Analyse Transportation network for eco-friendliness and quantify the levels.
CO 3	Design eco-friendly transportation systems
CO 4	Apply concepts of sustainability in developing green fuels and vehicles.
CO 5	Design for sustainability in public transport, Applications of tools like GIS, GPS.

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	2	2	2	1		1	3	1		2		1	2	3
CO 2	2	2	1	2	1	1	1	1	1	1		1	2	2
CO 3	2	1	3	1	2	1	1	1	2	2	1	2	2	3
CO 4	2	2	2	1	1	2	2	1	1	1	1	2	2	3
CO 5	1	3	3	3	3	3	2	2	3	3	2	2	2	3

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	-	-	-
Analyse	5	5	20
Evaluate	5	5	20
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 3 marks 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:

- 1 Course Outcome 1 (CO1):** Define sustainability in transportation context. How can the principles be applied here?
- 2 Course Outcome 2 (CO2):** Describe the procedure of evaluating the performance of a transportation network, citing any example.
- 3 Course Outcome 3 (CO3):** What are the characteristics of eco-friendly transportation system? What changes are to be incorporated in designing the same?
- 4 Course Outcome 4 (CO4):** Discuss the concept of green vehicles describing the aspects that make them green.

5 Course Outcome 5 (CO5): Giving KSRTC as an example explain how sustainability can be achieved in public transport.

Syllabus

Module	Contents	Hours
1	Introduction to the concept of sustainability, basic principles.	10
2	Transport networks basics, Performance measures, Advanced transport systems	10
3	Design for eco-friendly Transportation, Professional praxis in sustainability, concept and applications	9
4	Emerging concepts in sustainable transportation: green vehicles and green roads	9
5	Sustainable public transport: Promoting public transport, Transit oriented development, integrated multi-modal transport.	7

Text Books

1. Chisty, J, Lall, K. Introduction to Transportation Engineering. PHI
2. O' Flaherty, C.A (Ed.), Transport Planning and Traffic Engineering, Elsevier.
3. Jeffrey Tumlin: Sustainable Transportation Planning: Tools for Creating Vibrant, Healthy, and Resilient Communities, John Wiley & Sons

References

1. Green Transportation Logistics: The Quest for Win-Win Solutions Editors: Psaraftis, Harilaos N. (Ed.), Springer
2. Thomas Abdallah: Sustainable Mass Transit: Challenges and Opportunities in Urban Public Transportation.
3. Chester Patton, Public Transit Operations: The Strategic Professional
4. Sustainable and Efficient Transport: Incentives for Promoting a Green Transport Market- Edited by Ellen Eftestøl-Wilhelmsson, et al, Edward Elgar
5. Rani Iyer: Green Transport: Exploring Eco-Friendly Travel for a Better Tomorrow:
6. Smart City project reports.
7. Environmental Impact Assessment Reports on Infrastructure projects.

Course Content and lecture Schedule:

No.	Topic	Course Outcome	No. of Hrs
1	Module 1		Total: 10
1.1	Sustainability: Definition, concepts	CO1	2
1.2	Environmental impacts of infrastructure projects, depletion of natural resources and pollution.	CO1	2
1.3	Problems of present transportation systems, performance analysis. Introduction to eco-friendly systems.	CO1	6
2	Module 2		Total: 10
2.1	Transportation network basics: network planning, design, operation and management (elementary ideas only)	CO2	3
2.2	Measures of network performance, factors and parameters.	CO2	4
2.3	Introduction to advanced transport systems: metro, monorail, maglev, hyperloop.	CO2	3
3	Module 3		Total: 7
3.1	Eco-friendly transport: Necessity, Basics: reducing natural fuels	CO3	2
3.2	Eco-friendly transport network. Parameters, design, implementation.	CO3	3
3.3	Professional praxis in sustainability: concepts, practical applications. Paradigm shift: Mobility and accessibility.		2
4	Module 4		Total: 9
4.1	Emerging concepts in sustainable transportation: green vehicles and green roads: basics and necessity.	CO4	2
4.2	Green vehicles: minimizing fuel consumption, alternate fuels. Green pathways: sustainable design, construction,	CO4	4
4.3	Forgiving designs for safety, ITS applications.	CO4	3
5	Module 5		Total: 9
5.1	Sustainable public transport: Promoting public transport, Fleet management and scheduling: Concepts and tools only.	CO5	3
5.2	Transit oriented development (smart cities), integrated multi-modal transport, GIS applications.	CO5	6

5.3	Micro projects: i) Compilation of studies on green fuels and transport, with comparison. ii) A study on literature available on a typical smart city project, in the transport context, and propose designs. (may be given as assignments)		
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Model Question Paper

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

Course Code: CET383

Course Name: **Eco-friendly Transportation Systems (Minor)**

Marks:100 Duration: 3 hrs

PART A

(Answer all questions. Each question carry three marks)

1. Define sustainability with emphasis on transport.
2. List the principles of sustainability.
3. What are the fundamental elements of a transport network? How do they contribute to performance?
4. Compare metro and maglev technologies.
5. Why is an eco-friendly transport necessary? Cite a typical example.
6. Why is a paradigm shift necessary in sustainability?
7. Explain the terms: Green roads, Green fuels.
8. With a typical example, explain forgiving designs.
9. List a few methods of promoting public transport.
10. What do you understand from Transit Oriented Development?

PART B

(Answer one full question from each module)

11. a) Describe how an infrastructure project affects environment. (10)
 b) What are the issues with present transport systems? (4)

OR

- 12 a) When is a system deemed eco-friendly? Explain in transport context. (6)

- b). What are the parameters of performance analysis of transportation systems? Explain (8)
- 13 a) With a typical example, illustrate the performance evaluation of a transport network(6)
- b) What is hyperloop? Is it eco-friendly? How? (8)
- OR**
- 14a) Describe the process of network planning, design, operations and management (10)
- b) What are the challenges faced by metro rail systems? (4)
- 15a) Explain the principles of an eco-friendly transport network (8)
- b) Discuss the term professional praxis in a sustainability scenario. (6)
- OR**
- 16 a) How is the eco-friendliness of a transport network evaluated? Discuss the steps involved(8)
- b) Explain the factors involved in designing an eco-friendly network (6)
- 17 a) List the alternate fuels for transport and discuss any two (6)
- b) Define ITS. What are its application in eco-friendly transport. Explain any two. (8)
- OR**
- 18 a) Discuss any two eco-friendly construction methods for roads (8)
- b) What are the methods of reducing fuel consumption in vehicles (6)
- 19a) Write a note on public transport fleet management. (6)
- b) /what is meant by integrated multi-modal transport? Discuss it's possibilities in a city in Kerala. (8)
- OR**
- 20 Discuss the applications of GIS and GPS in transport, explaining how eco-friendliness can be achieved. (14)

Assessment Pattern

Bloom's Category	Continuous Assessment		End Semester Examination
	Tests		
	1	2	
Remember	10	10	15
Understand	10	10	15
Apply	15	15	35
Analyse	15	15	35
Evaluate			
Create			

Mark distribution

Total Marks	CIE	ESE	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: 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 subdivisions.

Course Level Assessment Questions**CO1: To be able to appreciate the role of environmental engineering in improving the quality of environment**

1. Explain from a health perspective the need for treating drinking water and safe disposal of waste water
2. How to dispose the sludge from waste water treatment plant safely?
3. How to remove colloidal range particles from water to satisfy drinking water norms?

CO 2: To be able to plan for collection and conveyance of water and waste water

1. How design period is decided for water supply schemes?
2. Discuss various types of pumps used in a water supply scheme
3. Compare separate and combined sewerage systems

CO3: To be able to enhance natural water purification processes in an engineered environment

1. Discuss different types of aerators with their advantage and limitations
2. Design a continuous flow rectangular sedimentation tank for a population of 20,000 persons with an average per capita demand of 120 litres per day. Assume a detention period of 6 hours.
3. Design an activated sludge plant to treat 6.0 Mld of sewage with BOD of 210 mg/l. The final effluent should be 30 mg/l

CO4: To be able to decide on appropriate technology for water and waste water treatment

1. Compare aerobic and anaerobic biological processes for treating waste water
2. Explain in detail the different disinfection techniques available for water and waste water treatment?
3. Discuss the treatment method available for high strength waste water

SYLLABUS

Module 1

Introduction to environmental engineering and role of environmental engineers-enhancing natural purification processes in an engineered environment-public health perspective for treating water and waste water - 1hr

Water quantity estimation:

Population forecast- water demand estimation-types of demand- demand fluctuation -3 hrs

Estimation for waste water quantity:

Dry weather flow and storm water flow-population equivalent-design period - 2 hrs

Collection and conveyance:

water intake structures- -gravity flow and pressure flow systems- 1 hr

Systems of sewerage: separate and combined-types of pumps for water and waste water conveyance - 2 hrs

Module 2

Layout plan of a conventional water treatment plant- site selection-concept of unit operations and unit processes-Screening-types of screens -aeration -aerator types- 3 hrs

Theory and principles of sedimentation-Stoke's law-Types of settling -Design of plain sedimentation tanks - 4 hrs

Mechanisms of coagulation and flocculation, popular coagulants and feeding devices -2 hrs

Module 3

Filtration of water-theory of filtration-types of filters - design of arapid sand filter - 3hrs

Disinfection of water - various methods - advantages and limitations -2 hrs

Lay out of water distribution network-types-methods of distribution-network analysis -Hardy cross and equivalent pipe methods-4 hrs

Module 4

Layout plan of a conventional waste water treatment plant- site selection- concept of primary, secondary and tertiary treatment- 1hr

Unit operations in waste water- primary treatment -equalization of flow- 2hrs

Secondary treatment methods-basic concepts of biological unit processes-aerobic and anaerobic- attached and suspended growth processes (Concepts only)- 2 hr

Activated sludge process- basic concepts-design of a conventional Activated Sludge Plant - 3hrs

Trickling filter (Concept only)- types- construction & operation - 1 hr

Module 5

Anaerobic treatment of high strength waste water- Up flow Anaerobic Sludge Blanket (UASB) reactor (Concept only)- 2 hrs

Natural waste water treatment systems-Oxidation Ponds and Lagoons-Wetlands and Root-zone systems (Concepts only)- 3 hrs

Low cost sanitation systems- Design of a septic tank and soak-pit - 2 hr

Sludge treatment (concepts only) -thickening- digestion- dewatering- drying- composting- 2hrs

Text Books:

1. Howard S Peavy, Donald R Rowe and George Tchobanoglous, Environmental Engineering, Mc Graw Hill Education , 2013
2. Mackenzie L Davis, David A Cornwell, Introduction to Environmental Engineering, Mc Graw Hill Education, 2014
3. S.K.Garg, Water Supply Engineering, Khanna Publishers. 2010
4. G S Birdie, Water Supply and Engineering, Dhanapat Rai Publishing Company, 2014
5. J. Arceivala, Shyam R. Asolekar, Wastewater Treatment for Pollution Control and Reuse, McGrawhill Education, 2007
6. S.K. Garg, Sewage disposal and air pollution engineering, Khanna Publishers. 2008

References:

1. Metcalf and Eddy, Waste Water Engineering, Tata McGraw Hill publishing Co Ltd, 2003
2. Syed R Qasim, Edward M Motley, Guang Zhu, Water Works Engineering-Planning, Design & Operation, PHI Learning, 2012.
3. Syed R Qasim, Wastewater Treatment Plants-Planning, Design & Operation, CRC Press,1999

Lecture Plan- Environmental Engineering

Module	Topic	Course Outcomes addressed	No. of Lectures
1	Module I: Total Lecture Hours -9		
1.1	Introduction to environmental engineering and role of environmental engineers-enhancing natural purification processes in an engineered environment-public health perspective for treating water and waste water	CO1	1
1.2	Water and waste water quantity estimation: Population forecast- water demand estimation-types of demand- demand fluctuation	CO2	3
1.3	Estimation for waste water quantity- dry weather flow and storm water flow-population equivalent-design period	CO2	2
1.4	Collection and conveyance: water intake structures- -gravity flow and pressure flow systems-	CO2	1
1.5	Systems of sewerage: separate and combined-types of pumps for water and waste water conveyance	CO2	2
2	Module II: Total Lecture Hours- 9		
2.1	Layout plan of a conventional water treatment plant- site selection-concept of unit operations and unit processes- Screening-types of screens-aeration-aerator types	CO1,CO4	3
2.2	Theory and principles of sedimentation-Stoke's law- Types of settling -Design of plain sedimentation tanks	CO3	4
2.3	Mechanisms of coagulation and flocculation, popular coagulants and feeding devices	CO3	2
3	Module III: Total Lecture Hours-9		
3.1	Filtration of water-theory of filtration-types of filters - design of rapid sand filter	CO3,CO4	3
3.2	Disinfection of water - various methods - advantages and limitations	CO4	2
3.3	Lay out of water distribution network-methods of distribution-network analysis -Hardy cross and equivalent pipe methods	CO4	4
4	Module IV: Total Lecture Hours- 9		

4.1	Layout plan of a conventional waste water treatment plant- site selection- concept of primary, secondary and tertiary treatment	CO1	1
4.2	Unit operations in waste water- primary treatment - equalization of flow	CO3	2
4.3	Secondary treatment methods- basic concepts of biological unit processes-aerobic and anaerobic- attached and suspended growth processes (Concepts only)	CO4	2
4.4	Activated sludge process- basic concepts-design of a conventional Activated Sludge Plant	CO3	3
4.5	Trickling filter (Concept only)- types- construction & operation	CO3	1
5	Module V: Total Lecture Hours- 9		
5.1	Anaerobic treatment of high strength waste water- Up flow Anaerobic Sludge Blanket (UASB) reactor (Concept only)	CO3	2
5.2	Natural waste water treatment systems-Oxidation Ponds and Lagoons-Wetlands and Root-zone systems (Concepts only)	CO3, CO4	3
5.3	Low cost sanitation systems- Design of a septic tank and soak-pit	CO3	2
5.4	Sludge treatment (concepts only) - thickening- digestion- dewatering- drying- composting	CO4	2

Model Question Paper

Reg No.: _____

Name: _____

**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
SIXTH SEMESTER B.TECH DEGREE EXAMINATION****Course Code: CET304****Course Name: ENVIRONMENTAL ENGINEERING**

Max. Marks: 100

Duration: 3 Hours

Part A*(Answer all questions; each question carries 3 marks)*

1. Explain dry weather flow
2. What is an intake?
3. Why screens are used in water and waste water treatment plants?
4. What is hindered settling?
5. Compare slow sand filter and rapid sand filter
6. Explain the principle of disinfection
7. Discuss the unit operations and unit processes in a waste water treatment plant
8. Compare aerobic and anaerobic processes
9. How wetlands treat waste water?
10. Explain the working of a septic tank with a neat sketch

PART B*(Answer one full question from each module, each question carries 14 marks)*

11. (a) Explain in brief different methods used for prediction of future population of a city (9 Marks)
(b) What is fire demand? How will you calculate fire demand (5 Marks)
- OR
12. (a) Explain the term "Design Period" (5 Marks)
(b) Forecast the population of the town in the year 2040 from the following data using arithmetic increase method and geometric increase method

Year	1990	2000	2010	2020
Population	13400	19500	28500	36300

(9 Marks)

13. (a) Explain with sketches the types of aerators with advantages and limitations (6 Marks)

(b) Explain different types of settling (8Marks)

OR

14. (a) Explain the mechanisms of coagulation (5 Marks)

(b) Design a plain sedimentation tank for treating 6 MLD of water. Make suitable assumption. Prepare a neat sketch

(9 Marks)

15. (a) Explain the theory of filtration (5 Marks)

(b) Explain and compare various disinfection methods (9Marks)

OR

16. Design a rapid sand filter to treat 10 million litres of raw water per day allowing 0.5% of filtered water for backwashing. Half hour per day is used for backwashing. Assume necessary data. (14 Marks)

17. (a) Discuss the role of an equalization tank at a waste water treatment plant (4Marks)

(b) Discuss in detail various biological processes available for treating waste water (10 marks)

OR

18. (a) Explain primary, secondary and tertiary treatment phases (5 Marks)

(b) Design an activated sludge plant treat 6.0 Mld of domestic sewage having a BOD of 210 mg/l. The final effluent should have a BOD of 30 mg/l. (9 Marks)

19. (a) Discuss sludge treatment processes for safe disposal (9 Marks)

(b) Explain the working of a UASB with neat sketch (5 Marks)

OR

20. Discuss natural waste water treatment systems with neat sketches (14 Marks)

CET 386	ENVIRONMENTAL HEALTH AND SAFETY	CATEGORY	L	T	P	CREDIT	Year of Introduction
		VAC	3	1	0	3	2019

Preamble: The course is designed to build environmental health literacy among students and encourages them to take safety measures against various environmental hazards. It motivates the students in maintaining and improving the quality of the environment and empower learners to take appropriate actions to reduce the environment pollution.

Pre-requisite: Nil

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

CO1	Understand the Toxicology and Occupational Health associated with industries.
CO2	Identify chemical and microbial agents that originate in the environment and can impact human health.
CO3	Describe various measures to ensure safety in Construction industry.
CO4	Explain the effect of air and water pollution on environment.
CO5	Describe the safety measures against various environmental hazards.

CET 386 Environmental Health And Safety		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
	CO1	3					2	2							1	
	CO2	3					2	1								
	CO3	3					2	2								
	CO4	3					2	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	15	15	30
Evaluate			
Create			

Continuous Internal Evaluation Pattern:

Attendance	:	10marks
Continuous Assessment Test(2numbers)	:	25 marks
Assignment/Quiz/Course project	:	15marks
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 anyone. Each question can have maximum 2 sub-divisions and carry 14 marks.

Course Level Assessment

Qn. No	Question	Marks	Course outcome (CO) Assessed
Part A			
1	What are the socio- economic reasons in safety?	3	CO1
2	Define industrial hygiene.	3	CO1
3	Define noise. What are the compensation aspects of noise?	3	CO2
4	Explain about the biohazard control program.	3	CO2
5	Discuss the possible electrical injuries in a construction industry.	3	CO3
6	What are the hazards due to radiation?	3	CO3
7	What are the criteria air pollutants?	3	CO4
8	Describe the Depletion of Ozone Layer.	3	CO4
9	What are the benefits of safety inspection?	3	CO5
10	Discuss the role of an individual in conservation of natural resources.	3	CO5

Part B (Answer ANY ONE FULL question from each module)			
Module I			
11	Briefly explain about occupational related diseases found in the industries.	14	CO1
12	Write the short notes on : (i) Silicosis (ii) Asbestosis (iii) Anthracosis (iv) Anthrax.	14	CO1
Module II			
13(a)	Write briefly about the classification of biohazardous agents.	7	CO2
13(b)	What are the precautionary measures for chemical hazards?	7	CO2
14	Write short notes on : (i) Vapour (ii) Fog (iii) Dust (iv) Fumes.	14	CO2
Module III			
15	Explain effects of radiation on human body and the methods of radioactive waste disposal.	14	CO3
16(a)	What are the requirements for safe work platform?	7	CO3
16(b)	Discuss about the scaffolding inspections.	7	CO3
Module IV			
17	Describe the effect of air pollution on environment.	14	CO4
18	Describe the effect of water pollution on environment.	14	CO4
Module V			
19 (a)	What is First aid? Explain CPR.	7	CO5
19 (b)	What are the important points to be considered in carrying out workplace inspection?	7	CO5
20 (a)	Explain the first aid measure to be taken during i) gas poisoning, ii) heart attack, iii) chemical splash and iv) electric shock.	10	CO5
20 (b)	Briefly explain the elementary first aid	4	CO5

Model Question Paper

CIVIL ENGINEERING

Reg.No.:.....

QP CODE:.....

Name:.....

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

SIXTH SEMESTER B.TECH DEGREE EXAMINATION, MONTH & YEAR

Course Code: CET 386

Environment Health and Safety

Max. Marks: 100

Duration: 3 hours

Part A

(Answer all questions; each question carries 3 marks)

1. What are the socio- economic reasons in safety?
2. Define industrial hygiene.
3. Define noise. What are the compensation aspects of noise?
4. Explain about the biohazard control program.
5. Discuss the possible electrical injuries in a construction industry.
6. What are the hazards due to radiation?
7. What are the criteria air pollutants?
8. Describe the Depletion of Ozone Layer.
9. What are the benefits of safety inspection?
10. Discuss the role of an individual in conservation of natural resources.

Part B

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

Module I

11. Briefly explain about occupational related diseases found in the industries. (14 Marks)

OR

12. Write the short notes on : (14 Marks)

- (i) Silicosis
- (ii) Asbestosis
- (iii) Anthracosis
- (iv) Anthrax.

Module II

13. (a) Write briefly about the classification of biohazardous agents.(7 Marks)
 (b) What are the precautionary measures for chemical hazards? (7 Marks)

OR

14. Write short notes on :(14 Marks)
 (i)Vapour(ii) Fog (iii) Dust (iv) Fumes.

Module III

15. Explain effects of radiation on human body and the methods of radioactive waste disposal. (14 Marks)

OR

16. (a) What are the requirements for safe work platform? (7 Marks)
 (b) Discuss about the scaffolding inspections.(7 Marks)

Module IV

17. Describe the effect of air pollution on environment. (14 Marks)

OR

18. Describe the effect of water pollution on environment.(14 Marks)

Module V

19. (a) What are the important points in carrying out workplace inspection?(7 Marks)
 (b) What is First aid? Explain CPR. (7 Marks)

OR

20. (a) Explain the first aid measure to be taken during gas poisoning,(10 Marks)
 heart attack, chemical splash and electric shock.
 (b) Briefly explain the elementary first aid (4 Marks)

Course Code: CET 386
Environmental Health And Safety

Module I

Introduction to Occupational Health And Toxicology : Safety at work – Socio – Economic reasons. Introduction to health and safety at various industries. occupational related diseases-Musculoskeletal disorders, hearing impairment, carcinogens, silicosis, asbestosis, pneumoconiosis – Toxic materials and substances used in work, exposure limits, toxicological investigation, Industrial Hygiene, Arrangements by organisations to protect the workers.

Module II

Chemical hazards-dust, fumes, vapour, fog, gases, Methods of Control. **Biological hazards-** Classification of Biohazardous agents– bacterial agents, viral agents, fungal, parasitic agents, infectious diseases, control of biological agents at workplaces. Noise, noise exposure regulation and control.

Module III

Safety in Construction industry - Scaffolding and Working platform, Welding and Cutting, Excavation Work, Concreting, control measures to reduce the risk. Electrical Hazards, Protection against voltage fluctuations, Effects of shock on human body. Radiation Hazards, Types and effects of radiation on human body, disposal of radioactive waste.

Module IV

Air Pollution - air pollutants from industries, effect on human health, animals, Plants and Materials - depletion of ozone layer-concept of clean coal combustion technology.

Water Pollution - water pollutants-health hazards - effluent quality standards. Waste Management -waste identification, characterization and classification, recycling and reuse.

Module V

Safe working environment - The basic purpose and benefits of safety inspection, First-aid appliances, Shelters, rest rooms and lunch rooms, use of personal protective equipment, Role of an individual in conservation of natural resources, Methods for controlling water pollution, role of individual in prevention of pollution.

Text Books:

1. Environmental and Health and Safety Management by By Nicholas P. Cheremisinoff and Madelyn L. Graffia, William Andrew Inc. NY, 1995.
2. Effective Environmental, Health, and Safety Management Using the Team Approach by Bill Taylor, Culinary and Hospitality Industry Publications Services 2005.

3. The Facility Managers Guide to Environmental Health And Safety by Brian Gallant, Government Inst Publ., 2007.
4. R.K.Jain and Sunil S.Rao , Industrial Safety , Health and Environment Management Systems, Khanna publishers , New Delhi (2006).
5. Mackenzie L Davis, Introduction to Environmental Engineering, McGrawhill Education (India).

References:

1. Slote. L, Handbook of Occupational Safety and Health, JohnWilleyand Sons, NewYork.
2. Heinrich H.W, Industrial Accident Prevention, McGrawHillCompany,NewYork,1980.
3. S.P.Mahajan, "Pollution control in process industries", Tata McGraw Hill Publishing Company, New Delhi, 1993.



Course Code: CET 386

Environmental Health And Safety

Course content and Schedule of Lecture (sample)

Module	Topic	Course outcome addressed	No of Hours
Module I (9 Hours)			
1.1	Introduction to Occupational Health And Toxicology.	CO1	1
1.2	Safety at work – Socio – Economic reasons.	CO1	1
1.3	Introduction to health and safety at various industries.	CO1	1
1.4	Occupational related diseases-Musculoskeletal disorders, hearing impairment	CO1	1
1.5	Occupational related diseases - carcinogens, silicosis, asbestosis, pneumoconiosis.	CO1	1
1.6	Toxic materials and substances used in work.	CO1	1
1.7	Exposure limits, toxicological investigation.	CO1	1
1.8	Industrial Hygiene.	CO1	1
1.9	Arrangements by organisations to protect the workers.	CO1	1
Module II (9 Hours)			
2.1	Chemical hazards.	CO2	1
2.2	Dust, fumes, vapour, fog, gases.	CO2	1
2.3	Methods of Control.	CO2	1
2.4	Biological hazards.	CO2	1
2.5	Classification of Biohazardous agents.	CO2	1
2.6	Bacterial agents, viral agents, fungal, parasitic agents, infectious diseases.	CO2	1
2.7	Control of biological agents at workplaces.	CO2	1
2.8	Noise.	CO2	1
2.9	Noise exposure regulation and control.	CO2	1

Module III (8 Hours)			
3.1	Safety in Construction industry- Scaffolding and Working platform.	CO3	1
3.2	Welding and Cutting, Excavation Work, Concreting.	CO3	1
3.3	Control measures to reduce the risk.	CO3	1
3.4	Electrical Hazards.	CO3	1
3.5	Protection against voltage fluctuations.	CO3	1
3.6	Effects of shock on human body, Radiation Hazards	CO3	1
3.7	Types and effects of radiation on human body.	CO3	1
3.8	Disposal of radioactive waste.	CO3	1
Module IV (9 Hours)			
4.1	Air Pollution - air pollutants from industries.	CO4	1
4.2	Effect on human health, animals.	CO4	1
4.3	Plants and Materials - depletion of ozone layer.	CO4	1
4.4	Concept of clean coal combustion technology.	CO4	1
4.5	Water Pollution - water pollutants.	CO4	1
4.6	Health hazards - effluent quality standards.	CO4	1
4.7	Waste Management-waste identification.	CO4	1
4.8	Characterization and classification.	CO4	1
4.9	Recycling and reuse.	CO4	1
Module V (8 Hours)			
5.1	Safe working environment.	CO5	1
5.2	The basic purpose and benefits of safety inspection.	CO5	1
5.3	First-aid appliances.	CO5	1
5.4	Shelters, rest rooms and lunch rooms.	CO5	1
5.5	Use of personal protective equipment.	CO5	1

5.6	Role of an individual in conservation of natural resources.	CO5	1
5.7	Methods for controlling water pollution.	CO5	1
5.8	Role of individual in prevention of pollution.	CO5	1

APJ ABDUL KALAM
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CET 362	ENVIRONMENTAL IMPACT ASSESSMENT	CATEGORY	L	T	P	CREDIT	Year of Introduction
		PEC	3	0	0	3	2019

Preamble : This course introduces the methodologies for identifying, predicting, evaluating and mitigating the impacts on environment due to any developmental project or activities. Students will learn how to prepare an impact assessment report and devise an environment management plan. Sufficient background will be provided on the environmental clearance procedures in India.

Prerequisite: NIL

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

Course Outcome	Description of Course Outcome	Prescribed learning level
CO1	To appreciate the need for minimizing the environmental impacts of developmental activities	Understanding
CO2	To understand environmental legislation & clearance procedure in the country	Remembering, Understanding
CO 3	To apply various methodologies for assessing the environmental impacts of any developmental activity	Applying &Analysing
CO 4	To prepare an environmental impact assessment report	Analysing& Evaluating
CO 5	To conduct an environmental audit	Analysing &Evaluating

Mapping of course outcomes with program outcomes (Minimum requirement)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	-	-	-	-	-	2	2	-	-	-	-	-
CO 2	-	-	-	-	-	2	-	-	-	-	-	-
CO 3	2	-	-	3	2	-	3	-	-	-	-	-
CO4	-	-	-	2	-	2	2	3	-	3	-	-
CO5	-	-	-	2	1	-	2	2	-	2	-	-

Assessment Pattern

Bloom's Category	Continuous Assessment Tests		End Semester Examination
	1	2	
Remember	10	10	15
Understand	10	10	15
Apply	15	15	35
Analyse	15	15	35
Evaluate			
Create			

Mark distribution

Total Marks	CIE	ESE	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: 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 Questions

CO1: To be able to appreciate the need for minimizing the environmental impacts of developmental activities

1. Explain the evolution of EIA in India
2. Explain why EIA is needed for developmental projects.
3. What are the different ways in which development projects impact the water quality and quantity?

CO 2: To be able to understand environmental legislation & clearance procedure in the country

1. Two municipalities in Kerala plan to set up a Common Municipal Solid Waste Management Facility (CMSWMF). Explain the procedure required for the Environmental Clearance (EC) for the project as per the EIA Notification of 2006. (All CMSWMFs are category B projects)
2. Describe the procedure for obtaining environmental clearance according to EIA notification 2006.
3. The Environment (Protection) Act, 1986 is called an umbrella legislation. Substantiate the statement.

CO3: To be able to apply various methodologies for assessing the environmental impacts of any developmental activity

1. Prepare a simple checklist for assessment of socio economic impact due to the development of a highway.
2. Explain overlay mapping as an EIA method
3. Explain how to predict the impact of a highway project on air quality

CO4: To be able to prepare an environmental impact assessment report

1. Explain the Terms of Reference (ToR) for EIA report of a highway project
2. Explain the structure of EIA report
3. Explain the importance of an environmental management plan.

CO5: To be able to conduct an environmental audit

1. Explain the need for environmental auditing
2. What are the different types of environmental audits?
3. Explain the importance of ISO 14001 standard.

SYLLABUS**Module 1**

Definition, Need for EIA, Evolution of EIA: Global & Indian scenario -Environmental legislations in India- The Water (Prevention & Control of Pollution) Act 1974, The Air (Prevention & Control of Pollution) Act 1981, The Environmental (Protection) Act 1986- Environmental standards for water, air and noise quality- EIA Notification 2006

Module 2

Environmental clearance process in India: Screening, Scoping, Public Consultation, Appraisal-Form I-Category of projects-Generic structure of EIA report- Terms of Reference (ToR) -Types of EIA: strategic, regional, sectoral, project level- Rapid EIA and Comprehensive EIA- Initial Environmental Examination (IEE)

Module 3

EIA methodologies: Ad hoc, checklist, matrix, network and overlay-Impact Prediction, Evaluation and Mitigation-Prediction and assessment of the impact on water (surface water and groundwater), air, and noise environment- assessment of ecological impacts and Socio economic Impacts.

Module 4

Environmental Management Plan (EMP): Goal and purpose- Importance of EMP- Content of an EMP- Role of environmental monitoring program

Environment Audit: need for audit- audit types and benefits- environmental audit procedure

ISO 14001 standards: Importance, salient features - Stages in implementation- Benefits

Module 5

EIA case studies (Indian)- a highway project, a hydro electric power plant, an air port project, a quarry mining project and a solid waste management project

Text Books:

1. Larry W Canter, "Environmental Impact Assessment", McGraw Hill Inc. , New York, 1995
2. Betty Bowers Marriott, Environmental Impact Assessment: A Practical Guide, McGraw-Hill Professional, 1997
3. Environmental Impact Assessment, 2003, Y.Anjaneyulu, B.S Publications

References:

1. Lawrence, David P., Environmental Impact Assessment (Practical Solutions to Recurrent Problems), Wiley International, New Jersey.
2. Ministry of Environment & Forests, Govt. of India 2006 EIA Notification
3. Jain, R.K., Urban, L.V. and Stacey, G.S., Environment Impact Analysis, Von Nostrand Reinhold Company.

Lecture Plan- Environmental Impact Assessment

Module	Topic	Course Outcomes addressed	No. of Lectures
1	Module I: Total Lecture Hours -7		
1.1	Definition, Need for EIA, Evolution of EIA: Global & Indian scenario	CO1	1
1.2	Environmental legislations in India- The Water (Prevention & Control of Pollution) Act 1974, The Air (Prevention & Control of Pollution) Act 1981, The Environmental (Protection) Act 1986	CO2	3
1.3	Environmental standards for water, air and noise quality	CO2	1
1.4	EIA Notification 2006	CO2	2
2	Module II: Total Lecture Hours-7		
2.1	Environmental clearance process in India: Screening, Scoping, Public Consultation, Appraisal- Form I- Category of projects	CO2	3
2.2	Generic structure of EIA report- Terms of Reference (ToR)	CO4	1
2.3	Types of EIA: strategic, regional, sectoral, project level-	CO3	1
2.4	Rapid EIA and Comprehensive EIA	CO3	1
2.5	Initial Environmental Examination (IEE)	CO3	1
3	Module III: Total Lecture Hours-7		
3.1	EIA methodologies: Ad hoc, checklist, matrix, network and overlay	CO3	3
3.2	Impact Prediction, Evaluation and Mitigation- Prediction and assessment of the impact on water (surface water and groundwater), air, and noise	CO3	2

	environment		
3.3	assessment of ecological impacts and Socio economic Impacts	CO3	2
4	Module IV: Total Lecture Hours- 7		
4.1	Environmental Management Plan (EMP): Goal and purpose- Importance of EMP- Content of an EMP	CO4	2
4.2	Role of environmental monitoring program	CO4	1
4.3	Environment Audit: need for audit- audit types and benefits- environmental audit procedure	CO5	2
4.4	ISO 14001 standards: Importance, salient features - Stages in implementation- Benefits	CO5	2
5	Module V: Total Lecture Hours- 7		
5.1	EIA case studies (Indian)- a highway project	CO1, CO4	2
5.2	Hydro electric power plant, air port project	CO1, CO4	3
5.3	Quarry mining project, solid waste management project	CO1, CO4	3



Model Question Paper

Reg No.: _____

Name: _____

**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
SIXTH SEMESTER B.TECH DEGREE EXAMINATION****Course Code: CET362****Course Name: ENVIRONMENTAL IMPACT ASSESSMENT**

Max. Marks: 100

Duration: 3 Hours

Part A*(Answer all questions; each question carries 3 marks)*

1. Explain the need for EIA
2. Why environmental (protection) act, 1986 is called an umbrella act?
3. Discuss screening of projects
4. What is rapid EIA?
5. What is ad hoc method for impact assessment?
6. How to predict the impact of a proposed food industry on the water quality of a nearby river
7. Explain the benefits of an environmental audit
8. What is ISO 14001 standard?
9. What are the impacts of a highway project on local air quality
10. Discuss the environment monitoring program for a quarry mining industry.

PART B*(Answer one full question from each module, each question carries 14 marks)*

11. (a) Discuss environmental standards for water, air and noise (6 Marks)
(b) Discuss evolution of EIA in India (8 Marks)
- OR
12. (a) Discuss Air (Prevention & Control of Pollution) Act 1981 (5 Marks)
(b) Explain salient features of EIA notification 2006 (9 Marks)
13. (a) Discuss environmental clearance process in India (10 Marks)
(b) What is Form-1 ? (4 Marks)

OR

14. (a) What is Initial Environmental Examination? (5 Marks)
(b) Explain different types of EIA (9 Marks)
15. (a) Discuss in detail EIA methodologies (10 Marks)
(b) How can air quality modelling help in assessing the impact on air (4 Marks)
- OR
16. (a) Explain the steps to assess the impacts on the ecological environment due to a project (7Marks)
(b) Explain the steps involved in assessment of impacts on the water environment. (7 Marks)
17. (a) What are the different types of Environmental Audit? (5 Marks)
(b) Discuss the content of an environment management plan (9 marks)
- OR
18. (a) Discuss the salient features of an Environmental Monitoring Plan (5 Marks)
(b) Explain in detail the procedure for conducting an environmental audit (9 Marks)
19. Explain environmental clearance procedure for an airport (14 Marks)
- OR
20. Discuss how to assess the impacts of a hydro electric project (14 Marks)

Estd.

2014

HUT 300	Industrial Economics & Foreign Trade	Category	L	T	P	CREDIT
		HSMC	3	0	0	3

Preamble: To equip the students to take industrial decisions and to create awareness of economic environment.

Prerequisite: Nil

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

CO1	Explain the problem of scarcity of resources and consumer behaviour, and to evaluate the impact of government policies on the general economic welfare. (Cognitive knowledge level: Understand)
CO2	Take appropriate decisions regarding volume of output and to evaluate the social cost of production. (Cognitive knowledge level: Apply)
CO3	Determine the functional requirement of a firm under various competitive conditions. (Cognitive knowledge level: Analyse)
CO4	Examine the overall performance of the economy, and the regulation of economic fluctuations and its impact on various sections in the society. (Cognitive knowledge level: Analyse)
CO5	Determine the impact of changes in global economic policies on the business opportunities of a firm. (Cognitive knowledge level: Analyse)

Mapping of course outcomes with program outcomes

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

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	PO10	Communication
PO5	Modern tool usage	PO11	Project Management and Finance
PO6	The Engineer and Society	PO12	Lifelong learning

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	15	15	30

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
Continuous Assessment - Assignment	: 15 marks

Internal Examination Pattern:

Each of the two internal examinations has to be conducted out of 50 marks. First series test shall be preferably conducted after completing the first half of the syllabus and the second series test shall be preferably conducted after completing remaining part of the syllabus. There will be two parts: Part A and Part B. Part A contains 5 questions (preferably, 2 questions each from the completed modules and 1 question from the partly completed module), having 3 marks for each question adding up to 15 marks for part A. Students should answer all questions from Part A. Part B contains 7 questions (preferably, 3 questions each from the completed modules and 1 question from the partly completed module), each with 7 marks. Out of the 7 questions, a student should answer any 5.

End Semester Examination Pattern:

There will be two parts; Part A and Part B.

Part A : 30 marks

Part B : 70 marks

Part A contains 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 a student should answer any one. Each question can have maximum 3 sub-divisions and carries 14 marks.

SYLLABUS

HUT 300 Industrial Economics & Foreign Trade

Module 1 (Basic Concepts and Demand and Supply Analysis)

Scarcity and choice - Basic economic problems- PPC – Firms and its objectives – types of firms – Utility – Law of diminishing marginal utility – Demand and its determinants – law of demand – elasticity of demand – measurement of elasticity and its applications – Supply, law of supply and determinants of supply – Equilibrium – Changes in demand and supply and its effects – Consumer surplus and producer surplus (Concepts) – Taxation and deadweight loss.

Module 2 (Production and cost)

Production function – law of variable proportion – economies of scale – internal and external economies – Isoquants, isocost line and producer's equilibrium – Expansion path – Technical progress and its implications – Cobb-Douglas production function - Cost concepts – Social cost: private cost and external cost – Explicit and implicit cost – sunk cost - Short run cost curves - long run cost curves – Revenue (concepts) – Shutdown point – Break-even point.

Module 3 (Market Structure)

Perfect and imperfect competition – monopoly, regulation of monopoly, monopolistic completion (features and equilibrium of a firm) – oligopoly – Kinked demand curve – Collusive oligopoly (meaning) – Non-price competition – Product pricing – Cost plus pricing – Target return pricing – Penetration pricing – Predatory pricing – Going rate pricing – Price skimming.

Module 4 (Macroeconomic concepts)

Circular flow of economic activities – Stock and flow – Final goods and intermediate goods - Gross Domestic Product - National Income – Three sectors of an economy- Methods of measuring national income – Inflation- causes and effects – Measures to control inflation- Monetary and fiscal policies – Business financing- Bonds and shares -Money market and Capital market – Stock market – Demat account and Trading account - SENSEX and NIFTY.

Module 5 (International Trade)

Advantages and disadvantages of international trade - Absolute and Comparative advantage theory - Heckscher - Ohlin theory - Balance of payments – Components – Balance of Payments

deficit and devaluation – Trade policy – Free trade versus protection – Tariff and non-tariff barriers.

Reference Materials

1. Gregory N Mankiw, 'Principles of Micro Economics', Cengage Publications
2. Gregory N Mankiw, 'Principles of Macro Economics', Cengage Publications
3. Dwivedi D N, 'Macro Economics', Tata McGraw Hill, New Delhi.
4. Mithani D M, 'Managerial Economics', Himalaya Publishing House, Mumbai.
5. Francis Cherunilam, 'International Economics', McGraw Hill, New Delhi.

Sample Course Level Assessment Questions

Course Outcome 1 (CO1):

1. Why does the problem of choice arise?
2. What are the central problems?
3. How do we solve the basic economic problems?
4. What is the relation between price and demand?
5. Explain deadweight loss due to the imposition of a tax.

Course Outcome 2 (CO2):

1. What is shutdown point?
2. What do you mean by producer equilibrium?
3. Explain break-even point;
4. Suppose a chemical factory is functioning in a residential area. What are the external costs?

Course Outcome 3 (CO3):

1. Explain the equilibrium of a firm under monopolistic competition.
2. Why is a monopolist called price maker?
3. What are the methods of non-price competition under oligopoly?

4. What is collusive oligopoly?

Course Outcome 4 (CO4):

1. What is the significance of national income estimation?
2. How is GDP estimated?
3. What are the measures to control inflation?
4. How does inflation affect fixed income group and wage earners?

Course Outcome 5 (CO5):

1. What is devaluation?
2. Suppose a foreign country imposes a tariff on Indian goods. How does it affect India's exports?
3. What is free trade?
4. What are the arguments in favour of protection?

Model Question paper

QP CODE:

PAGES:3

Reg No:_____

Name :_____

**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY FIFTH /SIXTH SEMESTER
B.TECH DEGREE EXAMINATION, MONTH & YEAR**

Course Code: HUT 300

Course Name: Industrial Economics & Foreign Trade

Max.Marks:100

Duration: 3 Hours

PART A

Answer all Questions. Each question carries 3 Marks

1. Why does an economic problem arise?
2. What should be the percentage change in price of a product if the sale is to be increased by 50 percent and its price elasticity of demand is 2?
3. In the production function $Q = 2L^{1/2}K^{1/2}$ if $L=36$ how many units of capital are needed to produce 60 units of output?
4. Suppose in the short run $AVC < P < AC$. Will this firm produce or shut down? Give reason.
5. What is predatory pricing?
6. What do you mean by non- price competition under oligopoly?
7. What are the important economic activities under primary sector?
8. Distinguish between a bond and share?
9. What are the major components of balance of payments?

10. What is devaluation?

(10 x 3 = 30 marks)

PART B

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

MODULE I

11. a) Prepare a utility schedule showing units of consumption, total utility and marginal utility, and explain the law of diminishing marginal utility. Point out any three limitations of the law.
- b) How is elasticity of demand measured according to the percentage method? How is the measurement of elasticity of demand useful for the government?

Or

12. a) Explain the concepts consumer surplus and producer surplus.
- b) Suppose the government imposes a tax on a commodity where the tax burden met by the consumers. Draw a diagram and explain dead weight loss. Mark consumer surplus, producer surplus, tax revenue and dead weight loss in the diagram.

MODULE II

13. a) What are the advantages of large-scale production?
- b) Explain Producer equilibrium with the help of isoquants and isocost line. What is expansion path?

Or

14. a) Explain break-even analysis with the help of a diagram.
- b) Suppose the monthly fixed cost of a firm is Rs. 40000 and its monthly total variable cost is Rs. 60000.
- If the monthly sales is Rs. 120000 estimate contribution and break-even sales.
 - If the firm wants to get a monthly profit of Rs.40000, what should be the sales?
- c) The total cost function of a firm is given as $TC=100+50Q - 11Q^2+Q^3$. Find marginal cost when output equals 5 units.

MODULE III

15. a) What are the features of monopolistic competition?
b) Explain the equilibrium of a firm earning supernormal profit under monopolistic competition.

Or

16. a) Make comparison between perfect competition and monopoly.
b) Explain price rigidity under oligopoly with the help of a kinked demand curve.

MODULE IV

17. a) How is national income estimated under product method and expenditure method?
b) Estimate GDPmp, GNPmp and National income

Private consumption expenditure	= 2000 (in 000 cores)
Government Consumption	= 500
NFIA	= -(300)
Investment	= 800
Net=exports	=700
Depreciation	= 400
Net-indirect tax	= 300

Or

18. a) What are the monetary and fiscal policy measures to control inflation?
b) What is SENSEX?

MODULE V

19. a) What are the advantages of disadvantages of foreign trade?
b) Explain the comparative cost advantage.

Or

20. a) What are the arguments in favour protection?
b) Examine the tariff and non-tariff barriers to international trade.

(5 × 14 = 70 marks)

Teaching Plan

Module 1 (Basic concepts and Demand and Supply Analysis)		7 Hours
1.1	Scarcity and choice – Basic economic problems - PPC	1 Hour
1.2	Firms and its objectives – types of firms	1 Hour
1.3	Utility – Law of diminishing marginal utility – Demand – law of demand	1 Hour
1.4	Measurement of elasticity and its applications	1 Hour
1.5	Supply, law of supply and determinants of supply	1 Hour
1.6	Equilibrium – changes in demand and supply and its effects	1 Hour
1.7	Consumer surplus and producer surplus (Concepts) – Taxation and deadweight loss.	1 Hour
Module 2 (Production and cost)		7 Hours
2.1	Productions function – law of variable proportion	1 Hour
2.2	Economies of scale – internal and external economies	1 Hour
2.3	producers equilibrium – Expansion path	1 Hour
2.4	Technical progress and its implications – cob Douglas Production function	1 Hour
2.5	Cost concepts – social cost: private cost and external cost – Explicit and implicit cost – sunk cost	1 Hour
2.6	Short run cost curves & Long run cost curves	1 Hour
2.7	Revenue (concepts) – shutdown point – Break-even point.	1 Hour
Module 3 (Market Structure)		6 hours
3.1	Equilibrium of a firm, MC – MR approach and TC – TR approach	1 Hour
3.2	Perfect competition & Imperfect competition	1 Hour
3.3	Monopoly – Regulation of monopoly – Monopolistic competition	1 Hour
3.4	Oligopoly – kinked demand curve	1 Hour
3.5	Collusive oligopoly (meaning) – Non price competition	1 Hour
3.6	Cost plus pricing – Target return pricing – Penetration, Predatory pricing – Going rate pricing – price skimming	1 Hour

Module 4 (Macroeconomic concepts)		7 Hours
4.1	Circular flow of economic activities	1 Hour
4.2	Stock and flow – Final goods and intermediate goods – Gross Domestic Product - National income – Three sectors of an economy	1 Hour
4.3	Methods of measuring national income	1 Hour
4.4	Inflation – Demand pull and cost push – Causes and effects	1 Hour
4.5	Measures to control inflation – Monetary and fiscal policies	1 Hour
4.6	Business financing – Bonds and shares – Money market and capital market	1 Hour
4.7	Stock market – Demat account and Trading account – SENSEX and NIFTY	1 Hour
Module 5 (International Trade)		8 Hours
5.1	Advantages and disadvantages of international trade	1 Hour
5.2	Absolute and comparative advantage theory	2 Hour
5.3	Heckscher – Ohlin theory	1 Hour
5.4	Balance of payments - components	1 Hour
5.5	Balance of payments deficit and devaluation	1 Hour
5.6	Trade policy – Free trade versus protection	1 Hour
5.7	Tariff and non tariff barriers.	1 Hour

CET 398	ENVIRONMENTAL POLLUTION MODELLING	CATEGORY	L	T	P	CREDIT	Year of Introduction
		VAC	3	1	0	4	2019

Preamble : This course introduces various approaches for environmental pollution modeling. Students will learn how to develop a verified and validated model. The mathematics behind various environmental pollution models with their uncertainties will be discussed.

Prerequisite: NIL

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

Course Outcome	Description of Course Outcome	Prescribed learning level
CO1	To appreciate the mathematical modelling approach	Understanding
CO2	To learn how to build a model to represent physical transport of pollutants in environment	Understanding, Applying
CO 3	To simulate pollution transport scenarios in water, air and noise environment	Applying , Analysing
CO 4	To interpret the modelling results for decision support	Analysing

Mapping of course outcomes with program outcomes (Minimum requirement)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	3	-	-	-	-	-	-	-	-	-	-	-
CO 2	3	-	-	-	-	-	-	-	-	-	-	-
CO 3	-	2	-	2	-	-	-	-	-	-	-	-
CO4	-	2	-	2	-	-	-	-	-	-	-	-

Assessment Pattern

Bloom's Category	Continuous Assessment Tests		End Semester Examination
	1	2	
Remember	10	10	15
Understand	10	10	15
Apply	15	15	35
Analyse	15	15	35
Evaluate			
Create			

Mark distribution

Total Marks	CIE	ESE	ESE Duration
150	50	100	3 hours

Continuous Internal Evaluation Pattern:

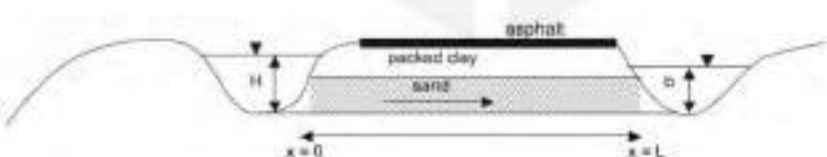
Attendance	: 10 marks
Continuous Assessment Test (2 numbers)	: 25 marks
Assignment/Quiz/Course project	: 15 marks

End Semester Examination Pattern: 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 Questions**CO1: To appreciate the mathematical modelling approach**

1	Discuss the classification of mathematical models
2	Explain how advection-diffusion equation is useful for modelling contaminant transport in ground water
3	How gaussian dispersion model is useful for air pollution modelling of point sources?

CO 2: To learn how to build a model to represent physical transport of pollutants in environment

1	Explain model building procedure
2	<p>What is the flow equation for the following situation?</p> 

3	Discuss how salinity intrusion is modeled
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CO3: To simulate pollution transport scenarios in water, air and noise environment

1	The SO ₂ concentration from 700 MW coal fired power plant has to be estimated. It burns 5% sulphur coal at the rate of 350KG / MW H. Stack height is 150m and plume rise is 50m. The wind speed at stack height is 6 m/s and neutral stability condition exists. Calculate the ground level concentration at 2 km downwind distance, given that $\sigma_y = 80\text{m}$ and $\sigma_z = 120\text{m}$.
2	The initial BOD of a river just below a sewage outfall is 25 mg/L. The oxygen deficit just upstream from the outfall is 2 mg/L. The deoxygenation rate coefficient k_d is 0.4/day, and the reaeration rate coefficient k_r is 0.7/day. The river is flowing at a speed of 30 km /day. (a) Find the critical distance downstream at which DO is a minimum (b) Find the minimum DO
3	Water levels in two wells far from shoreline are 50 cm and 1.0 m respectively. The wells are separated by a distance of 1 km. Hydraulic conductivity of the aquifer is 10m/d. Thickness of aquifer is 50m. Calculate the length of saltwater wedge and position of interface. Density of salt water can be taken as 1.025 g/cm ³

CO4: To interpret the modelling results for decision support

1	Explain how gaussian dispersion model help in predicting the impact of a proposed coal power plant in a locality
2	A chemical spill occurs above a sloping, shallow unconfined aquifer consisting of medium sand with $K=1\text{ m/d}$ and a porosity of 30%. Several monitoring wells are drilled in order to determine the regional hydraulic gradient. The hydraulic head from a well drilled near the spill location yielded a value of 5m. At a distance of 200m down the slope another well yielded a hydraulic head of 1m. Do you need to worry about safe drinking water availability in the well 200 m down the slope?
3	The distance from the base of a pumping well to the freshwater-saltwater interface is 100 m, the pumping rate is 3000 m ³ /day, and the hydraulic conductivity is 10 m/d. What's the maximum permitted pumping rate for the well?

SYLLABUS**Module1**

Role of models in environmental pollution studies- objectives of modelling-modelling principles-types of models-classification of mathematical models-deterministic, stochastic, continuous, discrete, static, dynamic, linear and non-linear-model building framework-model calibration, validation, verification and sensitivity analysis-model scales, error and uncertainty -distributions in modelling data of environmental pollutant concentrations- log-normal, Weibull, and gamma

Module 2

Air pollution modelling: Transport and dispersion of air pollutants- estimating concentrations from point sources –Dispersion Modelling- Gaussian Plume Model – determination of dispersion parameters, atmospheric stability-box models- line source model-area source model-puff model

Module 3

Water quality modeling: historical development of water quality models; rivers and streams water quality modelling– low flow analysis – pollutant transport-advection, diffusion and dispersion— Modelling lake water quality-mass balance for well mixed lakes-models for dissolved oxygen; Streeter Phelps model- sediment transport modelling

Module4

Groundwater modelling: use of ground water models-ground water flow modeling-Darcy's law-ground water flow equations for homogenous, heterogenous, isotropic and anisotropic conditions-mass transport of solutes,advection diffusion equation,favorable conditions for contaminant transport-modelling parameters and boundary conditions, seawater intrusion – basic concepts and modeling-Ghyben-Herzberg formula-popular ground water models

Module5

Environmental noise - noise generation mechanisms- need for noise modelling- modelling inputs-sound propagation factors- Equivalent Continuous Sound Pressure Level (Leq)-noise mapping methodology-modelling traffic noise-CoRTN and RLS90 models

Text Books

1. Gilbert M Masters Wendell P Ela, Introduction to Environmental Engineering & Science, Pearson,2013
2. Steven C.Chapra, Surface Water Quality Modeling, The McGraw-Hill Companies,Inc., New York, 1997.
3. Todd David Keith, Ground water Hydrology, Fourth edition, John Wiley and Sons, New York, 2004..
4. C.P Kumar, Ground water assessment and modelling, Createspace Independent Pub, 2015

References

1. Seinfeld and Pandis, Atmospheric chemistry and physics, Wiley 2016
2. Marcello Benedini, George Tsakiris, Water quality modelling for rivers and streams, Springer 2013
3. Mary Anderson William Woessner Randall Hunt, Applied ground water modelling, Academic Press, 2015
4. Enda Murphy Eoin King, Environmental Noise Pollution, Elsevier, 2014

Lecture Plan- Environmental Impact Assessment

Module	Topic	Course Outcomes addressed	No. of Lectures
1	Module I: Total Lecture Hours -9		
1.1	Role of models in environmental pollution studies- objectives of modelling-modelling principles-	CO1	1
1.2	types of models-classification of mathematical models-deterministic, stochastic, continuous, discreet, static, dynamic, linear and non-linear-	CO1	2
1.3	model building framework-model calibration, validation, verification and sensitivity analysis-model scales, error and uncertainty -	CO2	3
1.4	distributions in modelling data of environmental pollutant concentrations- log-normal, Weibull, and gamma	CO1,CO2	3
2	Module II: Total Lecture Hours- 9		
2.1	Air pollution modelling: Transport and dispersion of air pollutants	CO2	1
2.2	estimating concentrations from point sources – dispersion modelling- Gaussian Plume Model – determination of dispersion parameters, atmospheric stability	CO2, CO3, CO4	4
2.3	box models- line source model-area source model-puff model	CO2, CO3, CO4	4
3	Module III: Total Lecture Hours-9		
3.1	Water quality modeling: historical development of water quality models	CO1,CO2	1

3.2	Rivers and streams water quality modelling– low flow analysis – pollutant transport-advection, diffusion and dispersion	CO2, CO3	2
3.3	Modelling lake water quality-mass balance for well mixed lakes	CO2, CO3	2
3.4	models for dissolved oxygen; Streeter Phelps model-	CO2, CO3,CO4	3
3.5	sediment transport modelling	CO2, CO3,CO4	1
4	Module IV: Total Lecture Hours- 9		
4.1	Groundwater modelling: use of ground water models-ground water flow modeling-Darcy's law-ground water flow equations for homogenous, heterogenous, isotropic and anisotropic conditions-	CO1,CO2	3
4.2	mass transport of solutes, advection dispersion equation, favorable conditions for contaminant transport-modelling parameters and boundary conditions	CO2,CO3,CO4	3
4.3	seawater intrusion – basic concepts and modeling-Ghyben–Herzberg formula, popular ground water models	CO2,CO3,CO4	3
5	Module V: Total Lecture Hours- 9		
5.1	Environmental noise - noise generation mechanisms-need for noise modellingnoise mapping methodology-	CO2	3
5.2	modelling inputs-sound propagation factors - Equivalent Continuous Sound Pressure Level (Leq)-	CO2	3
5.3	modelling traffic noise-CoRTN and RLS90 models	CO3	3

Model Question Paper

Reg No.: _____

Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
SIXTH SEMESTER B.TECH DEGREE EXAMINATION

Course Code: CET398

Course Name: ENVIRONMENTAL POLLUTION MODELLING

Max. Marks: 100

Duration: 3 Hours

Part A

(Answer all questions; each question carries 3 marks)

1. Why do we need models in environmental studies?
2. A model can never represent the reality. Explain
3. What are the assumptions used in a box model?
4. Explain how atmospheric stability influence dispersion of air pollutants?
5. Explain Streeter-Phelps model
6. How modeling lake water quality is different from modeling river water quality?
7. Explain the role of Darcy's law in ground water modelling
8. Explain Ghyben-Herzberg relation
9. What are the parameters influencing propagation of environmental noise?
10. What you mean by Equivalent Continuous Sound Pressure Level ?

PART B

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

11. (a) Why do we need models? Explain with an example (5 Marks)
(b) Discuss various types of models used in environmental science (9 Marks)

OR

12. (a) Reliability of a model does not necessarily increase with model complexity. Why? (5 Marks)
(b) Discuss the model building framework (9 Marks)

13. (a) An air sampling station is located at an azimuth of 203° from a cement plant at a distance of 1500 meters. The cement plant releases fine particulate matter at the rate of 94.5 g/s from a 30 meter high stack. What is the contribution from the cement plant to the ambient particulate

matter concentration at the sampling station when the wind is from 30° at 3 m/s. Given that $\sigma_y = 150\text{m}$ and $\sigma_z = 87\text{m}$ (9 Marks)

- (b) What is plume rise? How it influences air quality modelling? (5Marks)

OR

14. (a) How stability parameters used in Gaussian model are determined? (5 Marks)

- (b) Discuss in detail various air quality models and their use (9 Marks)

15. (a) Briefly discuss the historical development of water quality models (9 Marks)

- (b) What input data are needed for sediment transport modelling (4 Marks)

OR

16. (a) The initial BOD of a river just below a sewage outfall is 25 mg/L. The oxygen deficit just upstream from the outfall is 2 mg/L. The deoxygenation rate coefficient k_d is 0.4/day, and the reaeration rate coefficient k_r is 0.7/day. The river is flowing at a speed of 30 km /day.

- (i) Find the critical distance downstream at which DO is a minimum

- (ii) Find the minimum DO (9Marks)

- (b) Explain low flow analysis (5 Marks)

17. (a) An aquifer has a cross section with a horizontal width of 265m, and a vertical thickness below the water table of 42m. The water table is 36 m below the ground surface. Each day 3340 m³ of water is discharged through the cross section. The aquifer rock has an effective porosity of 27.1%. Find the Seepage velocity through the aquifer (5 Marks)

- (b) Discuss the basic mechanisms that drives the contaminant transport in ground water (9 marks)

OR

18. (a) What are the contaminant, soil and site properties and their combinations that are critical in the transport of contaminants to ground water (5 Marks)

- (b) The distance from the base of a pumping well to the freshwater-saltwater interface is 100 m, the pumping rate is 3000 m³/day, and the hydraulic conductivity is 10 m/d.

- (i) What will be the position of the interface?

- (ii) What's the maximum permitted pumping rate for the well? (9 Marks)

19. (a) Discuss the need for environmental noise modelling (5 Marks)

- (b) Explain noise mapping methodology (9 Marks)

OR

20. (a) Explain the noise generation mechanisms (5Marks)

- (b) Discuss how traffic noise can be modelled? (9 Marks)

MCN401	INDUSTRIAL SAFETY ENGINEERING	CATEGORY	L	T	P	CREDIT
		MCN	2	1	0	-

Preamble: The course is intended to give knowledge of various safety management principles, various safety systems, various machine guarding devices, hazard identification techniques, energy sources, systems & applications and the need in the present context. Learners will be able to compare different hazard identification tools and choose the most appropriate based on the nature of industry. It aims to equip students in working with projects and to take up research work in connected areas

Prerequisite: Nil

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

CO1	Describe the theories of accident causation and preventive measures of industrial accidents. (Cognitive Knowledge level: Understand)
CO2	Explain about personal protective equipment, its selection, safety performance & indicators and importance of housekeeping. (Cognitive Knowledge level: Understand)
CO3	Explain different issues in construction industries. (Cognitive Knowledge level: Understand)
CO4	Describe various hazards associated with different machines and mechanical material handling. (Cognitive Knowledge level: Understand)
CO5	Utilise different hazard identification tools in different industries with the knowledge of different types of chemical hazards. (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	2	2				1
CO2	2	1	2		1	1	1	1				1
CO3	2	2	2		1	1	1	1	1	1		1
CO4	2	2	2		1	1	1	1	1	1		1
CO5	2	2	2	1	1	1	1	1	1	1		1

Abstract POs defined by National Board of Accreditation			
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		PO10 Communication
PO5	Modern tool usage		PO11 Project Management and Finance
PO6	The Engineer and Society		PO12 Life long learning

Assessment Pattern

	Continuous Assessment Tests		End Semester Examination
	1	2	
Remember	10	10	10
Understand	20	20	20
Apply	20	20	70
Analyse			
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 : 25 marks

Continuous Assessment - Assignment : 15 marks

Internal Examination Pattern:

Each of the two internal examinations has to be conducted out of 50 marks. First series test shall be preferably conducted after completing the first half of the syllabus and the second series test shall be preferably conducted after completing remaining part of the syllabus. There will be two parts: Part A and Part B. Part A contains 5 questions (preferably, 2 questions each from the completed modules and 1 question from the partly completed module), having 3 marks for each question adding up to 15 marks for part A. Students should answer all questions from Part A. Part B contains 7 questions (preferably, 3 questions each from the completed modules and 1 question from the partly completed module), each with 7 marks. Out of the 7 questions, a student should answer any 5.

End Semester Examination Pattern:

There will be two parts; Part A and Part B. Part A contains 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 a student should answer any one. Each question can have maximum 2 sub-divisions and carries 14 marks.

Syllabus

MCN401- Industrial Safety Engineering (35 hrs)

Module I (Safety introduction- 5 hrs)

Need for safety. Safety and productivity. Definitions: Accident, Injury, Unsafe act, Unsafe Condition, Dangerous Occurrence, Reportable accidents. Theories of accident causation. Safety organization- objectives, types, functions, Role of management, supervisors, workmen, unions, government and voluntary agencies in safety. Safety policy. Safety Officer-responsibilities, authority. Safety committee-need, types, advantages.

Module II (Personal protection in work environment- 7 hrs)

Personal protection in the work environment, Types of PPEs, Personal protective equipment- respiratory and non-respiratory equipment. Standards related to PPEs. Monitoring Safety Performance: Frequency rate, severity rate, incidence rate, activity rate. Housekeeping: Responsibility of management and employees. Advantages of good housekeeping. 5 s of housekeeping. Work permit system- objectives, hot work and cold work permits. Typical industrial models and methodology. Entry into confined spaces.

Module III (Safety issues in construction- 7 hrs)

Introduction to construction industry and safety issues in construction Safety in various construction operations – Excavation and filling – Under-water works – Under-pinning & Shoring – Ladders & Scaffolds – Tunneling – Blasting – Demolition – Confined space – Temporary Structures. Familiarization with relevant Indian Standards and the National Building Code provisions on construction safety. Relevance of ergonomics in construction safety. Ergonomics Hazards - Musculoskeletal Disorders and Cumulative Trauma Disorders.

Module IV (Safety hazards in machines- 8 hrs)

Machinery safeguard-Point-of-Operation, Principle of machine guarding -types of guards and devices. Safety in turning, and grinding. Welding and Cutting-Safety Precautions of Gas

welding and Arc Welding. Material Handling-Classification-safety consideration- manual and mechanical handling. Handling assessments and techniques- lifting, carrying, pulling, pushing, palletizing and stocking. Material Handling equipment-operation & maintenance. Maintenance of common elements-wire rope, chains slings, hooks, clamps. Hearing Conservation Program in Production industries.

Module V (Hazard identification and analysis- 8 hrs)

Hazard and risk, Types of hazards –Classification of Fire, Types of Fire extinguishers, fire explosion and toxic gas release, Structure of hazard identification and risk assessment. Identification of hazards: Inventory analysis, Fire and explosion hazard rating of process plants - The Dow Fire and Explosion Hazard Index, Preliminary hazard analysis, Hazard and Operability study (HAZOP)) – methodology, criticality analysis, corrective action and follow-up. Control of Chemical Hazards, Hazardous properties of chemicals, Material Safety Data Sheets (MSDS).

Text Books:

1. R.K Jain (2000) Industrial Safety, Health and Environment management systems, Khanna Publications.
2. Paul S V (2000), Safety management System and Documentation training Programme handbook, CBS Publication.
3. Krishnan, N.V. (1997). *Safety management in Industry*. Jaico Publishing House, New Delhi.
4. John V.Grimaldi and Rollin H.Simonds. (1989) *Safety management*. All India Traveller Book Seller, Delhi.
5. Ronald P.Blake. (1973). *Industrial safety*. Prentice Hall, New Delhi.
6. Alan Waring. (1996). *Safety management system*. Chapman & Hall, England.
7. Vaid, K.N., (1988). Construction safety management. National Institute of Construction Management and Research, Mumbai.
8. AIChE/CCPS. (1992). *Guidelines for Hazard Evaluation Procedures*. (second edition). Centre for Chemical Process Safety, American Institute of Chemical Engineers, New York.

Course Level Assessment Questions:

Course Outcome 1 (CO1):

1. Which are the various accident causation theories? Explain.
2. Define terms: Accident, Reportable accident, Dangerous occurrence.

Course Outcome 2 (CO2):

1. Discuss different types of personal protective equipment
2. Discuss about how to compare the safety performance of two industries.
3. Discuss the significance of work permit system in accident prevention.

Course Outcome 3 (CO3):

1. Distinguish ladders and scaffolds along with their safety features.
2. Discuss the safety requirement for a confined space entry.
3. Explain the important provision in the National Building Code.

Course Outcome 4 (CO4):

1. Explain the various principles used in machine guarding.
2. Explain the issues in mechanical material handling.

Course Outcome 5 (CO5):

1. Selection of different types of fire extinguishers accordance to type of fire.
2. Conduct a HAZOP study for a batch reactor of your choice.
3. Determine different types of Chemical hazards associated with industries

Model Question Paper

**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
VII SEMESTER B. TECH DEGREE EXAMINATION
MCN401- INDUSTRIAL SAFETY ENGINEERING**

Maximum: 100 Marks

Duration: 3 hours

PART A

Answer all questions, each question carries 3 marks

1. Differentiate Unsafe act and Unsafe conditions with suitable examples
2. Discuss the significance of a safety committee in improving the safety performance of an industry
3. Which are the different types of permit? Highlight its suitability.
4. Which are five 'S' used in housekeeping?
5. List the various safety features of ladders.
6. How safety of the workers can be ensured during a demolition operations.
7. Which are the hazards associated with manual material handling?
8. Discuss the safety issues of Gas welding operations.
9. Differentiate Hazard and Risk.
10. Why MSDS is mandatory for chemical products.

(10 X 3 = 30 Marks)

PART B

Answer one full question from each module

Module 1

11. List the various accident causation theories and explain any one in details. (14 Marks)
12. a) Discuss the significance of safety policy in reducing the accidents. (4 Marks)
b) Safety and productivity are the two sides of a coin'. Are you agreeing with this statement? Explain with your arguments. (10 Marks)

Module 2

13. a) Classify the personal protective equipment. List the suitability of at least fifteen types of PPEs. (10 Marks)

b) How will you calculate the frequency rate? Explain with an example. (4 Marks)

14. a) How will you compare the safety performance of two industries? Explain with suitable example. (10 Marks)

b) Which are the steps to be followed in confined space entry to protect the life a worker. (4 Marks)

Module 3

15. Discuss the safety and fire protection facilities required for a high rise building as per National building code. (14 Marks)

16. a) Identify the various hazards during the different stages of building construction. (7 Marks)

b) Discuss the important types of ergonomic hazards associated with industries.(7 Marks)

Module 4

17. Which are the various types of machine guarding devices used industries. Discuss the suitability of each machine guarding devices. (14 Marks)

18. With suitable sketches briefly explain seven defects of wire ropes. (14 Marks)

Module 5

19. What is Hazard and Operability Analysis? How do you conduct a HAZOP analysis? (14 Marks)

20. Discuss about different types of chemical hazards. (14 Marks)

Course Contents and Lecture Schedule

No.	Topic	No. of Lectures/ Tutorials L-T
1	Introduction to Industrial safety Engineering	
1.1	Need for safety. Safety and productivity. Definitions: Accident, Injury, Unsafe act, Unsafe Condition, Dangerous Occurrence. Reportable accidents	1
1.2	Theories of accident causation. Safety organization.	2
1.3	Role of management, supervisors, workmen, unions, government and voluntary agencies in safety.	3
1.4	Safety Officer-responsibilities, authority.	4
1.5	Safety committee-need, types, advantages.	5
2	Personal protection in the work environment	
2.1	Types of PPEs, respiratory and non-respiratory equipment.	6
2.2	Standards related to PPEs	7
2.3	Monitoring Safety Performance: Frequency rate, severity rate	8,
2.4	Monitoring Safety Performance: incidence rate, activity rate.	9
2.5	Housekeeping: Responsibility of management and employees. Advantages of good housekeeping. 5 s of housekeeping.	10
2.6	Work permit system- objectives, hot work and cold work permits.	11
2.7	Typical industrial models and methodology. Entry into confined spaces.	12
3	Introduction to construction industry and safety	
3.1	Excavation and filling – Under-water works – Under-pinning & Shoring	13
3.2	Ladders & Scaffolds – Tunneling	14
3.3	Blasting –Demolition – Confined space	15
3.4	Familiarization with relevant Indian Standards and the National Building Code provisions on construction safety.	16
3.5	Relevance of ergonomics in construction safety.	17
3.6	Ergonomics Hazards	18

3.7	Musculoskeletal Disorders and Cumulative Trauma Disorders.	19
4	Machinery safeguard	
4.1	Point-of-Operation, Principle of machine guarding -	20
4.2	Types of guards and devices.	21
4.3	Safety in Power Presses, primary & secondary operations - shearing -bending - rolling – drawing.	22
4.4	Safety in turning, boring, milling, planning and grinding.	23
4.5	Welding and Cutting-Safety Precautions of Gas welding and Arc Welding,	24
4.6	Cutting and Finishing.	25
4.7	Material Handling-Classification-safety consideration- manual and mechanical handling. Handling assessments and techniques- lifting, carrying, pulling, pushing, palletizing and stocking.	26
4.8	Material Handling equipment-operation & maintenance. Maintenance of common elements-wire rope, chains slings, hooks, clamps	27
5	Hazard identification	
5.1	Hazard and risk, Types of hazards – Classification of Fire	28
5.2	Types of Fire extinguishers fire, explosion and toxic gas release.	29
5.3	Inventory analysis, Fire and explosion hazard rating of process plants	30
5.4	The Dow Fire and Explosion Hazard Index.	31
5.5	Preliminary hazard analysis, Hazard and Operability study (HAZOP)	32
5.6	Chemical hazard- Classifications, Control of Chemical Hazards.	33
5.7	Hazardous properties of chemicals	34
5.8	Material Safety Data Sheets (MSDS).	35

HUT 310	Management for Engineers	Category	L	T	P	Credit
		HMC	3	0	0	3

Preamble: This course is intended to help the students to learn the basic concepts and functions of management and its role in the performance of an organization and to understand various decision-making approaches available for managers to achieve excellence. Learners shall have a broad view of different functional areas of management like operations, human resource, finance and marketing.

Prerequisite: Nil

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

CO1	Explain the characteristics of management in the contemporary context (Cognitive Knowledge level: Understand).
CO2	Describe the functions of management (Cognitive Knowledge level: Understand).
CO3	Demonstrate ability in decision making process and productivity analysis (Cognitive Knowledge level: Understand).
CO4	Illustrate project management technique and develop a project schedule (Cognitive Knowledge level: Apply).
CO5	Summarize the functional areas of management (Cognitive Knowledge level: Understand).
CO6	Comprehend the concept of entrepreneurship and create business plans (Cognitive Knowledge level: Understand).

Mapping of course outcomes with program outcomes

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

Abstract POs defined by National Board of Accreditation				
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		PO10	Communication
PO5	Modern tool usage		PO11	Project Management and Finance
PO6	The Engineer and Society		PO12	Life long learning

Assessment Pattern

Bloom's Category	Test 1 (Marks in percentage)	Test 2 (Marks in percentage)	End Semester Examination (Marks in percentage)
Remember	15	15	30
Understand	15	15	30
Apply	20	20	40
Analyse			
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 : 25 marks

Continuous Assessment - Assignment : 15 marks

Internal Examination Pattern:

Each of the two internal examinations has to be conducted out of 50 marks. First series test shall be preferably conducted after completing the first half of the syllabus and the second series test shall be preferably conducted after completing remaining part of the syllabus. There will be two parts: Part A and Part B. Part A contains 5 questions (preferably, 2 questions each from the completed modules and 1 question from the partly completed module), having 3 marks for each question adding up to 15 marks for part A. Students should answer all questions from Part A. Part B contains 7 questions (preferably, 3 questions each from the completed modules and 1 question from the partly completed module), each with 7 marks. Out of the 7 questions, a student should answer any 5.

End Semester Examination Pattern:

There will be two parts; Part A and Part B. Part A contains 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 a student should answer any one. Each question can have maximum 2 sub-divisions and carries 14 marks.

SYLLABUS

HUT 310 Management for Engineers (35 hrs)

Module 1 (Introduction to management Theory- 7 Hours)

Introduction to management theory, Management Defined, Characteristic of Management, Management as an art-profession, System approaches to Management, Task and Responsibilities of a professional Manager, Levels of Manager and Skill required.

Module 2 (management and organization- 5 hours)

Management Process, Planning types , Mission, Goals, Strategy, Programmes, Procedures, Organising, Principles of Organisation, Delegation, Span of Control, Organisation Structures, Directing, Leadership, Motivation, Controlling..

Module 3 (productivity and decision making- 7 hours)

Concept of productivity and its measurement; Competitiveness; Decision making process; decision making under certainty, risk and uncertainty; Decision trees; Models of decision making.

. Module 4 (project management- 8 hours)

Project Management, Network construction, Arrow diagram, Redundancy. CPM and PERT Networks, Scheduling computations, PERT time estimates, Probability of completion of project, Introduction to crashing.

Module 5 (functional areas of management- 8 hours)

Introduction to functional areas of management, Operations management, Human resources management, Marketing management, Financial management, Entrepreneurship, Business plans, Corporate social responsibility, Patents and Intellectual property rights.

References:

1. H. Koontz, and H. Weihrich, Essentials of Management: An International Perspective. 8th ed., McGraw-Hill, 2009.
2. P C Tripathi and P N Reddy, Principles of management, TMH, 4th edition, 2008.
3. P. Kotler, K. L. Keller, A. Koshy, and M. Jha, Marketing Management: A South Asian Perspective. 14th ed., Pearson, 2012.
4. M. Y. Khan, and P. K. Jain, Financial Management, Tata-McGraw Hill, 2008.
5. R. D. Hisrich, and M. P. Peters, Entrepreneurship: Strategy, Developing, and Managing a New Enterprise, 4th ed., McGraw-Hill Education, 1997.
6. D. J. Sumanth, Productivity Engineering and Management, McGraw-Hill Education, 1985.
7. K.Ashwathappa, 'Human Resources and Personnel Management', TMH, 3rd edition, 2005.
8. R. B. Chase, Ravi Shankar and F. R. Jacobs, Operations and Supply Chain Management, 14th ed. McGraw Hill Education (India), 2015.

Sample Course Level Assessment Questions

Course Outcome1 (CO1): Explain the systems approach to management?

Course Outcome 2 (CO2): Explain the following terms with a suitable example Goal, Objective, and Strategy.

Course Outcome 3 (CO3): Mr. Shyam is the author of what promises to be a successful novel. He has the option to either publish the novel himself or through a publisher. The publisher is offering Mr. Shyam Rs. 20,000 for signing the contract. If the novel is successful, it will sell 200,000 copies. Else, it will sell 10,000 copies only. The publisher pays a Re. 1 royalty per copy. A market survey indicates that there is a 70% chance that the novel will be successful. If Mr. Shyam undertakes publishing, he will incur an initial cost of Rs. 90,000 for printing and marketing., but each copy sold will net him Rs. 2. Based on the given information and the

decision analysis method, determine whether Mr. Shyam should accept the publisher's offer or publish the novel himself.

Course Outcome 4 (CO4): Explain the concepts of crashing and dummy activity in project management.

Course Outcome 5 (CO5): Derive the expression for the Economic order quantity (EOQ)?

Course Outcome 6 (CO6): Briefly explain the theories of Entrepreneurial motivation.?

Model Question Paper

QP CODE:

PAGES: 4

Reg No: _____

Name: _____

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

Course Code: HUT 310

Course name: Management for Engineers

Max Marks: 100

Duration: 3 Hours

PART-A (Answer All Questions. Each question carries 3 marks)

1. "Management is getting things done through other." Elaborate.
2. Comment on the true nature of management. Is it a science or an art?
3. Planning is looking ahead and controlling is looking back. Comment with suitable examples
4. Explain the process of communication?
5. Explain the hierarchy of objectives?
6. Explain the types of decisions?
7. Describe the Economic man model?
8. Explain the concepts of crashing and dummy activity in project management.
9. Differentiate the quantitative and qualitative methods in forecasting.
10. What are the key metrics for sustainability measurement? What makes the measurement and reporting of sustainability challenging?

PART-B (Answer any one question from each module)

11. a) Explain the systems approach to management. (10)
b) Describe the roles of a manager (4)

OR

12. a) Explain the 14 principles of administrative management? **(10)**

b) Explain the different managerial skills **(4)**

13. a) What are planning premises, explain the classification of planning premises. **(10)**

b) Distinguish between strategy and policy. How can policies be made effective. **(4)**

OR

14 a) Explain three motivational theories. **(9)**

b) Describe the managerial grid. **(5)**

15. a) Modern forest management uses controlled fires to reduce fire hazards and to stimulate new forest growth. Management has the option to postpone or plan a burning. In a specific forest tract, if burning is postponed, a general administrative cost of Rs. 300 is incurred. If a controlled burning is planned, there is a 50% chance that good weather will prevail and burning will cost Rs. 3200. The results of the burning may be either successful with probability 0.6 or marginal with probability 0.4. Successful execution will result in an estimated benefit of Rs. 6000, and marginal execution will provide only Rs. 3000 in benefits. If the weather is poor, burning will be cancelled incurring a cost of Rs. 1200 and no benefit. i) Develop a decision tree for the problem. (ii) Analyse the decision tree and determine the optimal course of action. **(8)**

b) Student tuition at ABC University is \$100 per semester credit hour. The Education department supplements the university revenue by matching student tuition, dollars per dollars. Average class size for typical three credit course is 50 students. Labour costs are \$4000 per class, material costs are \$20 per student, and overhead cost are \$25,000 per class. (a) Determine the total factor productivity. (b) If instructors deliver lecture 14 hours per week and the semester lasts for 16 weeks, what is the labour productivity? **(6)**

OR

16. a) An ice-cream retailer buys ice cream at a cost of Rs. 13 per cup and sells it for Rs. 20 per cup; any remaining unsold at the end of the day, can be disposed at a salvage price of Rs. 2.5 per cup. Past sales have ranged between 13 and 17 cups per day; there is no reason to believe that

sales volume will take on any other magnitude in future. Find the expected monetary value and EOL, if the sales history has the following probabilities:
(9)

Market Size	13	14	15	16	17
Probability	0.10	0.15	0.15	0.25	0.35

b) At Modern Lumber Company, Kishore the president and a producer of an apple crates sold to growers, has been able, with his current equipment, to produce 240 crates per 100 logs. He currently purchases 100 logs per day, and each log required 3 labour hours to process. He believes that he can hire a professional buyer who can buy a better quality log at the same cost. If this is the case, he increases his production to 260 crates per 100 logs. His labour hours will increase by 8 hours per day. What will be the impact on productivity (measured in crates per labour-hour) if the buyer is hired? What is the growth in productivity in this case?
(5)

17. a) A project has the following list of activities and time estimates:

Activity	Time (Days)	Immediate Predecessors
A	1	-
B	4	A
C	3	A
D	7	A
E	6	B
F	2	C, D
G	7	E, F
H	9	D
I	4	G, H

(a) Draw the network. (b) Show the early start and early finish times. (c) Show the critical path.
(10)

b) An opinion survey involves designing and printing questionnaires, hiring and training personnel, selecting participants, mailing questionnaires and analysing data. Develop the precedence relationships and construct the project network. **(4)**

OR

18. a) The following table shows the precedence requirements, normal and crash times, and normal and crash costs for a construction project:

Activity	Immediate Predecessors	Required Time (Weeks)		Cost (Rs.)	
		Normal	Crash	Normal	Crash
A	-	4	2	10,000	11,000
B	A	3	2	6,000	9,000
C	A	2	1	4,000	6,000
D	B	5	3	14,000	18,000
E	B, C	1	1	9,000	9,000
F	C	3	2	7,000	8,000
G	E, F	4	2	13,000	25,000
H	D, E	4	1	11,000	18,000
I	H, G	6	5	20,000	29,000

Draw the network. (b) Determine the critical path. (c) Determine the optimal duration and the associated cost. **(10)**

b) Differentiate between CPM and PERT. **(4)**

19. a) What is meant by market segmentation and explain the process of market segmentation **(8)**

b) The Honda Co. in India has a division that manufactures two-wheel motorcycles. Its budgeted sales for Model G in 2019 are 80,00,000 units. Honda's target ending inventory is 10,00,000 units and its beginning inventory is 12,00,000 units. The company's budgeted selling price to its distributors and dealers is Rs. 40,000 per motorcycle. Honda procures all its wheels from an

outside supplier. No defective wheels are accepted. Honda's needs for extra wheels for replacement parts are ordered by a separate division of the company. The company's target ending inventory is 3,00,000 wheels and its beginning inventory is 2,00,000 wheels. The budgeted purchase price is Rs. 1,600 per wheel.

(a) Compute the budgeted revenue in rupees.

(b) Compute the number of motorcycles to be produced.

Compute the budgeted purchases of wheels in units and in rupees.? (6)

OR

20. a) a) "Human Resource Management policies and principles contribute to effectiveness, continuity and stability of the organization". Discuss. (b) What is a budget? Explain how sales budget and production budgets are prepared? (10)

b) Distinguish between the following: (a) Assets and Liabilities (b) Production concept and Marketing concept (c) Needs and Wants (d) Design functions and Operational control functions in operations (4)

Teaching Plan

Sl.No	TOPIC	SESSION
Module I		
1.1	Introduction to management	1
1.2	Levels of managers and skill required	2
1.3	Classical management theories	3
1.4	neo-classical management theories	4
1.5	modern management theories	5
1.6	System approaches to Management,	6
1.7	Task and Responsibilities of a professional Manager	7
Module 2		
2.1	Management process – planning	8
2.2	Mission – objectives – goals – strategy – policies – programmes – procedures	9
2.3	Organizing, principles of organizing, organization structures	10
2.4	Directing, Leadership	11
2.5	Motivation, Controlling	12
Module III		
3.1	Concept of productivity and its measurement Competitiveness	13
3.2	Decision making process;	14
3.3	Models in decision making	15
3.4	Decision making under certainty and risk	16
3.5	Decision making under uncertainty	17
3.6	Decision trees	18
3.7	Models of decision making.	19
Module IV		
4.1	Project Management	20

Sl.No	TOPIC	SESSION
	Module I	
4.2	Network construction	21
4.3	Arrow diagram, Redundancy	22
4.4	CPM and PERT Networks	23
4.5	Scheduling computations	24
4.6	PERT time estimates	25
4.7	Probability of completion of project	26
4.8	Introduction to crashing	
	Module V	
5.1	Introduction to functional areas of management,	28
5.2	Operations management	29
5.3	Human resources management ,	30
5.4	Marketing management	31
5.5	Financial management	32
5.6	Entrepreneurship,	33
5.7	Business plans	34
5.8	Corporate social responsibility, Patents and Intellectual property rights	35

HUN 101	LIFE SKILLS	CATEGORY	L	T	P	CREDIT	YEAR OF INTRODUCTION
		MNC	2	0	2	---	2019

Preamble: Life skills are those competencies that provide the means for an individual to be resourceful and positive while taking on life's vicissitudes. Development of one's personality by being aware of the self, connecting with others, reflecting on the abstract and the concrete, leading and generating change, and staying rooted in time-tested values and principles is being aimed at. This course is designed to enhance the employability and maximize the potential of the students by introducing them to the principles that underly personal and professional success, and help them acquire the skills needed to apply these principles in their lives and careers.

Prerequisite: None

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

CO 1	Define and Identify different life skills required in personal and professional life
CO 2	Develop an awareness of the self and apply well-defined techniques to cope with emotions and stress.
CO 3	Explain the basic mechanics of effective communication and demonstrate these through presentations.
CO 4	Take part in group discussions
CO 5	Use appropriate thinking and problem solving techniques to solve new problems
CO 6	Understand the basics of teamwork and leadership

Mapping of course outcomes with program outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1						2		1	2	2	1	3
CO 2									3			2
CO 3						1			1	3		
CO 4										3		1
CO 5		3	2	1								
CO 6						1			3			

Mark distribution

Total Marks	CIE	ESE	ESE Duration
100	50	50	2 hours

Continuous Internal Evaluation

Total Marks: 50

Attendance	: 10 marks
Regular assessment	: 15 marks
Series test (one test only, should include first three modules)	: 25 marks

Regular assessment

➤ **Group Discussion (Marks: 9)**

Create groups of about 6 students each and engage them on a GD on a suitable topic for about 20 minutes. Parameters to be used for evaluation are as follows:

- Communication Skills : 3 marks
- Subject Clarity : 2 marks
- Group Dynamics : 2 marks
- Behaviours & Mannerisms : 2 marks

➤ **Presentation Skills (Marks: 6)**

Identify a suitable topic and ask the students to prepare a presentation (preferably a power point presentation) for about 10 minutes. Parameters to be used for evaluation are as follows:

- Communication Skills : 2 marks
- Platform Skills : 2 marks
- Subject Clarity/Knowledge : 2 marks

End Semester Examination

Total Marks: 50

Time: 2 hrs.

Part A: Short answer question (25 marks)

There will be one question from each MODULE (five questions in total, five marks each). Each question should be written in about maximum of 400 words. Parameters to be used for evaluation are as follows:

- (i) Content Clarity/Subject Knowledge
- (ii) Presentation style
- (iii) Organization of content

Part B: Case Study (25 marks)

The students will be given a case study with questions at the end. The students have to analyze the case and answer the question at the end. Parameters to be used for evaluation are as follows:

- (i) Analyze the case situation
- (ii) Key players/characters of the case
- (iii) Identification of the problem (both major & minor if exists)
- (iv) Bring out alternatives
- (v) Analyze each alternative against the problem
- (vi) Choose the best alternative
- (vii) Implement as solution
- (viii) Conclusion

(ix) Answer the question at the end of the case

Course Level Assessment Questions

Course Outcome 1 (CO1):

1. List 'life skills' as identified by WHO
2. What do you mean by effective communication?
3. What are the essential life skills required by a professional?

Course Outcome 2 (CO2)

1. Identify an effective means to deal with workplace stress.
2. How can a student apply journaling to stress management?
3. What is the PATH method? Describe a situation where this method can be used effectively.

Course Outcome 3(CO3):

1. Identify the communication network structure that can be observed in the given situations. Describe them.
 - (a) A group discussion on development.
 - (b) An address from the Principal regarding punctuality.
 - (c) A reporter interviewing a movie star.
 - (d) Discussing the answers of a test with a group of friends.
2. Elucidate the importance of non-verbal communication in making a presentation
3. Differentiate between kinesics, proxemics, and chronemics with examples.

Course Outcome 4 (CO4):

1. How can a participant conclude a group discussion effectively?
2. 'Listening skills are essential for effectively participating in a group discussion.' Do you agree? Substantiate your answer.

Course Outcome 5 (CO5):

1. Illustrate the creative thinking process with the help of a suitable example
2. Translate the following problem from verbal to graphic form and find the solution : *In a quiz, Ananth has 50 points more than Bimal, Chinmay has 60 points less than Ananth, and Dharini is 20 points ahead of Chinmay. What is the difference in points between Bimal and Dharini?*

3. List at least five ways in which the problem "How to increase profit?" can be redefined

Course Outcome 6 (CO6):

1. A group of engineers decided to brainstorm a design issue on a new product. Since no one wanted to disagree with the senior members, new ideas were not flowing freely. What group dynamics technique would you suggest to avoid this 'groupthink'? Explain the procedure.
2. "A group focuses on individual contribution, while a team must focus on synergy." Explain.
3. Identify the type of group formed / constituted in each of the given situations
 - a) A Police Inspector with subordinates reporting to him
 - b) An enquiry committee constituted to investigate a specific incident
 - c) The Accounts Department of a company
 - d) A group of book lovers who meet to talk about reading

Syllabus

Module 1

Overview of Life Skills: Meaning and significance of life skills, Life skills identified by WHO: Self-awareness, Empathy, Critical thinking, Creative thinking, Decision making, problem solving, Effective communication, interpersonal relationship, coping with stress, coping with emotion.

Life skills for professionals: positive thinking, right attitude, attention to detail, having the big picture, learning skills, research skills, perseverance, setting goals and achieving them, helping others, leadership, motivation, self-motivation, and motivating others, personality development, IQ, EQ, and SQ

Module 2

Self-awareness: definition, need for self-awareness; Coping With Stress and Emotions, Human Values, tools and techniques of SA: questionnaires, journaling, reflective questions, meditation, mindfulness, psychometric tests, feedback.

Stress Management: Stress, reasons and effects, identifying stress, stress diaries, the four A's of stress management, techniques, Approaches: action-oriented, emotion-oriented, acceptance-oriented, resilience, Gratitude Training,

Coping with emotions: Identifying and managing emotions, harmful ways of dealing with emotions, PATH method and relaxation techniques.

Morals, Values and Ethics: Integrity, Civic Virtue, Respect for Others, Living Peacefully. Caring, Sharing, Honesty, Courage, Valuing Time, Time management, Co operation, Commitment, Empathy, Self-Confidence, Character, Spirituality, Avoiding Procrastination, Sense of Engineering Ethics.

Module 3

21st century skills: Creativity, Critical Thinking, Collaboration, Problem Solving, Decision Making, Need for Creativity in the 21st century, Imagination, Intuition, Experience, Sources of Creativity, Lateral Thinking, Myths of creativity, Critical thinking Vs Creative thinking, Functions of Left Brain & Right brain, Convergent & Divergent Thinking, Critical reading & Multiple Intelligence.

Steps in problem solving: Problem Solving Techniques, Six Thinking Hats, Mind Mapping, Forced Connections. Analytical Thinking, Numeric, symbolic, and graphic reasoning. Scientific temperament and Logical thinking.

Module 4

Group and Team Dynamics: Introduction to Groups: Composition, formation, Cycle, thinking, Clarifying expectations, Problem Solving, Consensus, Dynamics techniques, Group vs Team, Team Dynamics, Virtual Teams. Managing team performance and managing conflicts, Intrapreneurship.

Module 5

Leadership: Leadership framework, entrepreneurial and moral leadership, vision, cultural dimensions. Growing as a leader, turnaround leadership, managing diverse stakeholders, crisis management. Types of Leadership, Traits, Styles, VUCA Leadership, Levels of Leadership, Transactional vs Transformational Leaders, Leadership Grid, Effective Leaders.

Lab Activities

Verbal

Effective communication and Presentation skills.

Different kinds of communication; Flow of communication; Communication networks, Types of barriers; Miscommunication

Introduction to presentations and group discussions.

Learning styles: visual, aural, verbal, kinaesthetic, logical, social, solitary; Previewing, KWL table, active listening, REAP method

Note-taking skills: outlining, non-linear note-taking methods, Cornell notes, three column note taking.

Memory techniques: mnemonics, association, flashcards, keywords, outlines, spider diagrams and mind maps, spaced repetition.

Time management: auditing, identifying time wasters, managing distractions, calendars and checklists; Prioritizing - Goal setting, SMART goals; Productivity tools and apps, Pomodoro technique.

Non Verbal:

Non-verbal Communication and Body Language: Forms of non-verbal communication; Interpreting body-language cues; Kinesics; Proxemics; Chronemics; Effective use of body language, Communication in a multi cultural environment.

Reference Books

1. Shiv Khera, *You Can Win*, Macmillan Books, New York, 2003.
2. Barun K. Mitra, *Personality Development & Soft Skills*, Oxford Publishers, Third impression, 2017.
3. ICT Academy of Kerala, *Life Skills for Engineers*, McGraw Hill Education (India) Private Ltd., 2016.
4. Caruso, D. R. and Salovey P, *The Emotionally Intelligent Manager: How to Develop and Use the Four Key Emotional Skills of Leadership*, John Wiley & Sons, 2004.
5. Kalyana, *Soft Skill for Managers*; First Edition; Wiley Publishing Ltd, 2015.
6. Larry James, *The First Book of Life Skills*; First Edition, Embassy Books, 2016.
7. Shalini Verma, *Development of Life Skills and Professional Practice*; First Edition; Sultan Chand (G/L) & Company, 2014.
8. Daniel Goleman, *Emotional Intelligence*; Bantam, 2006.
9. Remesh S., Vishnu R.G., *Life Skills for Engineers*, Ridhima Publications, First Edition, 2016.
10. Butterfield Jeff, *Soft Skills for Everyone*, Cengage Learning India Pvt Ltd; 1 edition, 2011.
11. *Training in Interpersonal Skills: Tips for Managing People at Work*, Pearson Education, India; 6 edition, 2015.
12. *The Ace of Soft Skills: Attitude, Communication and Etiquette for Success*, Pearson Education; 1 edition, 2013.

HUN 102	PROFESSIONAL COMMUNICATION	CATEGORY	L	T	P	CREDIT
		MNC	2	0	2	--

Preamble: Clear, precise, and effective communication has become a *sine qua non* in today's information-driven world given its interdependencies and seamless connectivity. Any aspiring professional cannot but master the key elements of such communication. The objective of this course is to equip students with the necessary skills to listen, read, write, and speak so as to comprehend and successfully convey any idea, technical or otherwise, as well as give them the necessary polish to become persuasive communicators.

Prerequisite: None

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

CO 1	Develop vocabulary and language skills relevant to engineering as a profession
CO 2	Analyze, interpret and effectively summarize a variety of textual content
CO 3	Create effective technical presentations
CO 4	Discuss a given technical/non-technical topic in a group setting and arrive at generalizations/consensus
CO 5	Identify drawbacks in listening patterns and apply listening techniques for specific needs
CO 6	Create professional and technical documents that are clear and adhering to all the necessary conventions

Mapping of course outcomes with program outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1										3		2
CO 2										1		3
CO 3						1			1	3		
CO 4										3		1
CO 5		1							2	3		
CO 6	1					1			1	3		

Mark distribution

Total Marks	CIE	ESE	ESE Duration
100	50	50	2 hours

Continuous Internal Evaluation

Total Marks: 50

Attendance	: 10 marks
Regular assessment	: 25 marks
Series test (one test only, should include verbal aptitude for placement and higher studies, this test will be conducted for 50 marks and reduced to 15)	: 15 marks

Regular assessment

Project report presentation and Technical presentation through PPT	: 7.5 marks
Listening Test	: 5 marks
Group discussion/mock job interview	: 7.5 marks
Resume submission	: 5 marks

End Semester Examination

Total Marks: 50, Time: 2 hrs.

Course Level Assessment Questions

Course Outcome 1 (CO1):

1. List down the ways in which gestures affect verbal communication.
2. Match the words and meanings
Ambiguous promotion
Bona fide referring to whole
Holistic not clear
Exaltation genuine
3. Expand the following Compound Nouns - a. Water supply. b. Object recognition. c. Steam turbine

Course Outcome 2 (CO2)

1. Read the passage below and prepare notes:

Mathematics, rightly viewed, possesses not only truth, but supreme beauty—a beauty cold and austere, like that of sculpture, without appeal to any part of our weaker nature, without the gorgeous trappings of painting or music, yet sublimely pure, and capable of a stern perfection such as only the greatest art can show. The true spirit of delight, the exaltation, the sense of being more than man, which is the touchstone of the highest excellence, is to be found in mathematics as surely as in poetry. What is best in mathematics deserves not merely to be learnt as a task, but to be assimilated as a part of daily thought, and brought again and again before the mind with ever-renewed encouragement. Real life is, to most men, a long second-best, a perpetual compromise between the ideal and the possible; but the world of pure reason knows no compromise, no practical limitations, no barrier to the creative activity embodying in splendid edifices the passionate aspiration after the perfect from which all great work springs. Remote from human passions, remote even from the pitiful facts of nature, the generations have gradually created an ordered cosmos, where pure thought can dwell as in its natural home, and where one, at least, of our nobler impulses can escape from the dreary exile of the actual world.

So little, however, have mathematicians aimed at beauty, that hardly anything in their work has had this conscious purpose. Much, owing to irrepressible instincts, which were better than avowed

beliefs, has been moulded by an unconscious taste; but much also has been spoilt by false notions of what was fitting. The characteristic excellence of mathematics is only to be found where the reasoning is rigidly logical: the rules of logic are to mathematics what those of structure are to architecture. In the most beautiful work, a chain of argument is presented in which every link is important on its own account, in which there is an air of ease and lucidity throughout, and the premises achieve more than would have been thought possible, by means which appear natural and inevitable. Literature embodies what is general in particular circumstances whose universal significance shines through their individual dress; but mathematics endeavours to present whatever is most general in its purity, without any irrelevant trappings.

How should the teaching of mathematics be conducted so as to communicate to the learner as much as possible of this high ideal? Here experience must, in a great measure, be our guide; but some maxims may result from our consideration of the ultimate purpose to be achieved.

- From "On the teaching of mathematics" – Bertrand Russell

2. Enumerate the advantages and disadvantages of speed reading. Discuss how it can impact comprehension.

Course Outcome 3(CO3):

1. What are the key elements of a successful presentation?
2. Elucidate the importance of non-verbal communication in making a presentation
3. List out the key components in a technical presentation.

Course Outcome 4 (CO4):

1. Discuss: 'In today's world, being a good listener is more important than being a good Speaker.'
2. Listen to a video/live group discussion on a particular topic, and prepare a brief summary of the proceedings.
3. List the do's and don'ts in a group discussion.

Course Outcome 5 (CO5):

1. Watch a movie clip and write the subtitles for the dialogue.
2. What do you mean by barriers to effective listening? List ways to overcome each of these.
3. What are the different types of interviews? How are listening skills particularly important in Skype/telephonic interviews?

Course Outcome 6 (CO6):

1. Explain the basic structure of a technical report.
2. You have been offered an internship in a much sought-after aerospace company and are very excited about it. However, the dates clash with your series tests. Write a letter to the Manager – University Relations of the company asking them if they can change the dates to coincide with your vacation.
3. You work in a well-reputed aerospace company as Manager – University Relations. You are in charge of offering internships. A student has sent you a letter requesting you to change the dates allotted to him since he has series exams at that time. But there are no vacancies available during the period he has requested for. Compose an e-mail informing him of this and suggest that he try to arrange the matter with his college.

Syllabus

Module 1

Use of language in communication: Significance of technical communication Vocabulary Development: technical vocabulary, vocabulary used in formal letters/emails and reports, sequence words, misspelled words, compound words, finding suitable synonyms, paraphrasing, verbal analogies. Language Development: subject-verb agreement, personal passive voice, numerical adjectives, embedded sentences, clauses, conditionals, reported speech, active/passive voice.

Technology-based communication: Effective email messages, slide presentations, editing skills using software. Modern day research and study skills: search engines, repositories, forums such as Git Hub, Stack Exchange, OSS communities (MOOC, SWAYAM, NPTEL), and Quora; Plagiarism

Module 2

Reading, Comprehension, and Summarizing: Reading styles, speed, valuation, critical reading, reading and comprehending shorter and longer technical articles from journals, newspapers, identifying the various transitions in a text, SQ3R method, PQRS method, speed reading. Comprehension: techniques, understanding textbooks, marking and underlining, Note-taking: recognizing non-verbal cues.

Module 3

Oral Presentation: Voice modulation, tone, describing a process, Presentation Skills: Oral presentation and public speaking skills, business presentations, Preparation: organizing the material, self-Introduction, introducing the topic, answering questions, individual presentation practice, presenting visuals effectively.

Debate and Group Discussions: introduction to Group Discussion (GD), differences between GD and debate; participating GD, understanding GD, brainstorming the topic, questioning and clarifying, GD strategies, activities to improve GD skills

Module 4

Listening and Interview Skills Listening: Active and Passive listening, listening: for general content, to fill up information, intensive listening, for specific information, to answer, and to understand. Developing effective listening skills, barriers to effective listening, listening to longer technical talks, listening to classroom lectures, talks on engineering /technology, listening to documentaries and making notes, TED talks.

Interview Skills: types of interviews, successful interviews, interview etiquette, dress code, body language, telephone/online (skype) interviews, one-to-one interview & panel interview, FAQs related to job interviews

Module 5

Formal writing: Technical Writing: differences between technical and literary style. Letter Writing (formal, informal and semi formal), Job applications, Minute preparation, CV preparation (differences between Bio-Data, CV and Resume), and Reports. Elements of style, Common Errors in Writing: describing a process, use of sequence words, Statements of Purpose, Instructions, Checklists.

Analytical and issue-based Essays and Report Writing: basics of report writing; Referencing Style (IEEE Format), structure of a report; types of reports, references, bibliography.

Lab Activities

Written: Letter writing, CV writing, Attending a meeting and Minute Preparation, Vocabulary Building

Spoken: Phonetics, MMFS (Multimedia Feedback System), Mirroring, Elevator Pitch, telephone etiquette, qualities of a good presentation with emphasis on body language and use of visual aids.

Listening: Exercises based on audio materials like radio and podcasts. Listening to Song. practice and exercises.

Reading: Speed Reading, Reading with the help of Audio Visual Aids, Reading Comprehension Skills

Mock interview and Debate/Group Discussion: concepts, types, Do's and don'ts- intensive practice

Reference Books

1. English for Engineers and Technologists (Combined edition, Vol. 1 and 2), Orient Blackswan 2010.
2. Meenakshi Raman and Sangeetha Sharma, "Technical Communication: Principles and Practice", 2nd Edition, Oxford University Press, 2011
3. Stephen E. Lucas, "The Art of Public Speaking", 10th Edition; McGraw Hill Education, 2012.
4. Ashraf Rizvi, "Effective Technical Communication", 2nd Edition, McGraw Hill Education, 2017.
5. William Strunk Jr. & E.B. White, "The Elements of Style", 4th Edition, Pearson, 1999.
6. David F. Beer and David McMurrey, Guide to writing as an Engineer, John Willey. New York, 2004.
7. Goodheart-Willcox, "Professional Communication", First Edition, 2017.
8. Training in Interpersonal Skills: Tips for Managing People at Work, Pearson Education, India, 6 edition, 2015.
9. The Ace of Soft Skills: Attitude, Communication and Etiquette for Success, Pearson Education; 1 edition, 2013.
10. Anand Ganguly, "Success in Interview", RPH, 5th Edition, 2016.
11. Raman Sharma, "Technical Communications", Oxford Publication, London, 2004.

Code.	Course Name	L	T	P	Hrs	Credit
HUT 200	Professional Ethics	2	0	0	2	2

Preamble: To enable students to create awareness on ethics and human values.

Prerequisite: Nil

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

CO 1	Understand the core values that shape the ethical behaviour of a professional.
CO 2	Adopt a good character and follow an ethical life.
CO 3	Explain the role and responsibility in technological development by keeping personal ethics and legal ethics.
CO 4	Solve moral and ethical problems through exploration and assessment by established experiments.
CO 5	Apply the knowledge of human values and social values to contemporary ethical values and global issues.

Mapping of course outcomes with program outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2
CO 1								2			2	
CO 2								2			2	
CO 3								3			2	
CO 4								3			2	
CO 5								3			2	

Assessment Pattern

Bloom's category	Continuous Assessment Tests		End Semester Exam
	1	2	
Remember	15	15	30
Understood	20	20	40
Apply	15	15	30

Mark distribution

Total Marks	CIE	ESE	ESE Duration
150	50	100	3 hours

Continuous Internal Evaluation Pattern:

Attendance	: 10 marks
Continuous Assessment Tests (2 Nos)	: 25 marks
Assignments/Quiz	: 15 marks

End Semester Examination Pattern: There will be two parts; Part A and Part B. Part A contains 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**Course Outcome 1 (CO1):**

1. Define integrity and point out ethical values.
2. Describe the qualities required to live a peaceful life.
3. Explain the role of engineers in modern society.

Course Outcome 2 (CO2)

1. Derive the codes of ethics.
2. Differentiate consensus and controversy.
3. Discuss in detail about character and confidence.

Course Outcome 3(CO3):

1. Explain the role of professional's ethics in technological development.
2. Distinguish between self interest and conflicts of interest.
3. Review on industrial standards and legal ethics.

Course Outcome 4 (CO4):

1. Illustrate the role of engineers as experimenters.
2. Interpret the terms safety and risk.
3. Show how the occupational crimes are resolved by keeping the rights of employees.

Course Outcome 5 (CO5):

1. Exemplify the engineers as managers.
2. Investigate the causes and effects of acid rain with a case study.
3. Explore the need of environmental ethics in technological development.

Model Question paper

QP CODE:

Reg No: _____

PAGES:3

Name : _____

**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY THIRD/FOURTH SEMESTER
B.TECH DEGREE EXAMINATION, MONTH & YEAR**

Course Code: HUT 200

Course Name: PROFESSIONAL ETHICS

Max. Marks: 100

Duration: 3 Hours

(2019-Scheme)

PART A**(Answer all questions, each question carries 3 marks)**

1. Define empathy and honesty.
2. Briefly explain about morals, values and ethics.
3. Interpret the two forms of self-respect.
4. List out the models of professional roles.
5. Indicate the advantages of using standards.
6. Point out the conditions required to define a valid consent?
7. Identify the conflicts of interests with an example?
8. Recall confidentiality.
9. Conclude the features of biometric ethics.
10. Name any three professional societies and their role relevant to engineers.

(10x3 = 30 marks)

PART B**(Answer one full question from each module, each question carries 14 marks)****MODULE I****11. a)** Classify the relationship between ethical values and law?**b)** Compare between caring and sharing.

(10+4 = 14 marks)

Or**12. a)** Exemplify a comprehensive review about integrity and respect for others.

- b) Discuss about co-operation and commitment. (8+6 = 14 marks)

MODULE II

- 13.a) Explain the three main levels of moral developments, devised by Kohlberg.

- b) Differentiate moral codes and optimal codes. (10+4 = 14 marks)

Or

14. a) Extrapolate the duty ethics and right ethics.

- b) Discuss in detail the three types of inquiries in engineering ethics (8+6 = 14 marks)

MODULE III

- 15.a) Summarize the following features of morally responsible engineers.

- (i) Moral autonomy (ii) Accountability

- b) Explain the rights of employees (8+6 = 14 marks)

Or

16. a) Explain the reasons for Chernobyl mishap ?

- b) Describe the methods to improve collegiality and loyalty. (8+6 = 14 marks)

MODULE IV

- 17.a) Execute collegiality with respect to commitment, respect and connectedness.

- b) Identify conflicts of interests with an example. (8+6 = 14 marks)

Or

18. a) Explain in detail about professional rights and employee rights.

- b) Exemplify engineers as managers.

MODULE V

- 19.a) Evaluate the technology transfer and appropriate technology.

- b) Explain about computer and internet ethics. (8+6 = 14 marks)

Or

20. a) Investigate the causes and effects of acid rain with a case study.

- b) Conclude the features of ecocentric and biocentric ethics. (8+6 = 14 marks)

Syllabus

Module 1 – Human Values.

Morals, values and Ethics – Integrity- Academic integrity-Work Ethics- Service Learning- Civic Virtue- Respect for others- Living peacefully- Caring and Sharing- Honestly- courage-Cooperation commitment- Empathy-Self Confidence -Social Expectations.

Module 2 - Engineering Ethics & Professionalism.

Senses of Engineering Ethics - Variety of moral issues- Types of inquiry- Moral dilemmas –Moral Autonomy – Kohlberg’s theory- Gilligan’s theory- Consensus and Controversy-Profession and Professionalism- Models of professional roles-Theories about right action –Self interest-Customs and Religion- Uses of Ethical Theories.

Module 3- Engineering as social Experimentation.

Engineering as Experimentation – Engineers as responsible Experimenters- Codes of Ethics- Plagiarism- A balanced outlook on law - Challenges case study- Bhopal gas tragedy.

Module 4- Responsibilities and Rights.

Collegiality and loyalty – Managing conflict- Respect for authority- Collective bargaining- Confidentiality- Role of confidentiality in moral integrity-Conflicts of interest- Occupational crime- Professional rights- Employee right- IPR Discrimination.

Module 5- Global Ethical Issues.

Multinational Corporations- Environmental Ethics- Business Ethics- Computer Ethics -Role in Technological Development-Engineers as Managers- Consulting Engineers- Engineers as Expert witnesses and advisors-Moral leadership.

Text Book

1. M Govindarajan, S Natarajan and V S Senthil Kumar, Engineering Ethics, PHI Learning Private Ltd, New Delhi,2012.
2. R S Naagarazan, A text book on professional ethics and human values, New age international (P) limited ,New Delhi,2006.

Reference Books

1. Mike W Martin and Roland Schinzinger, Ethics in Engineering,4th edition, Tata McGraw Hill Publishing Company Pvt Ltd, New Delhi,2014.
2. Charles D Fledermann, Engineering Ethics, Pearson Education/ Prentice Hall of India, New Jersey,2004.
3. Charles E Harris, Michael S Protchard and Michael J Rabins, Engineering Ethics- Concepts and cases, Wadsworth Thompson Learning, United states,2005.
4. <http://www.slideword.org/slidestag.aspx/human-values-and-Professional-ethics>.

Course Contents and Lecture Schedule

SL.No	Topic	No. of Lectures
1	Module 1 – Human Values.	25
1.1	Morals, values and Ethics, Integrity, Academic Integrity, Work Ethics	1
1.2	Service Learning, Civic Virtue, Respect for others, Living peacefully	1
1.3	Caring and Sharing, Honesty, Courage, Co-operation commitment	2
1.4	Empathy, Self Confidence, Social Expectations	1
2	Module 2- Engineering Ethics & Professionalism.	
2.1	Senses of Engineering Ethics, Variety of moral issues, Types of inquiry	1
2.2	Moral dilemmas, Moral Autonomy, Kohlberg's theory	1
2.3	Gilligan's theory, Consensus and Controversy, Profession & Professionalism, Models of professional roles, Theories about right action	2
2.4	Self interest-Customs and Religion, Uses of Ethical Theories	1
3	Module 3- Engineering as social Experimentation.	
3.1	Engineering as Experimentation, Engineers as responsible Experimenters	1
3.2	Codes of Ethics, Plagiarism, A balanced outlook on law	2
3.3	Challenger case study, Bhopal gas tragedy	2
4	Module 4- Responsibilities and Rights.	
4.1	Collegiality and loyalty, Managing conflict, Respect for authority	1
4.2	Collective bargaining, Confidentiality, Role of confidentiality in moral integrity, Conflicts of interest	2
4.3	Occupational crime, Professional rights, Employee right, IPR Discrimination	2
5	Module 5- Global Ethical Issues.	
5.1	Multinational Corporations, Environmental Ethics, Business Ethics, Computer Ethics	2
5.2	Role in Technological Development, Moral leadership	1
5.3	Engineers as Managers, Consulting Engineers, Engineers as Expert witnesses and advisors	2

CODE MCN201	SUSTAINABLE ENGINEERING	CATEGORY	L	T	P	CREDIT
			2	0	0	NIL

Preamble: Objective of this course is to inculcate in students an awareness of environmental issues and the global initiatives towards attaining sustainability. The student should realize the potential of technology in bringing in sustainable practices.

Prerequisite: NIL

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

CO 1	Understand the relevance and the concept of sustainability and the global initiatives in this direction
CO 2	Explain the different types of environmental pollution problems and their sustainable solutions
CO 3	Discuss the environmental regulations and standards
CO 4	Outline the concepts related to conventional and non-conventional energy
CO 5	Demonstrate the broad perspective of sustainable practices by utilizing engineering knowledge and principles

Mapping of course outcomes with program outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1						2	3					2
CO 2						2	3					2
CO 3						2	3					2
CO 4						2	3					2
CO 5						2	3					2

Assessment Pattern

Mark distribution

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

Continuous Internal Evaluation Pattern:

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

Total Marks	CIE	ESE	ESE Duration
150	50	100	3 hours

Course Level Assessment Questions

Course Outcome 1 (CO1): Understand the relevance and the concept of sustainability and the global initiatives in this direction

1. Explain with an example a technology that has contributed positively to sustainable development.
2. Write a note on Millennium Development Goals.

Course Outcome 2 (CO2): Explain the different types of environmental pollution problems and their sustainable solutions

1. Explain the 3R concept in solid waste management?
2. Write a note on any one environmental pollution problem and suggest a sustainable solution.
3. In the absence of green house effect the surface temperature of earth would not have been suitable for survival of life on earth. Comment on this statement.

Course Outcome 3(CO3): Discuss the environmental regulations and standards

1. Illustrate Life Cycle Analysis with an example of your choice.
2. “Nature is the most successful designer and the most brilliant engineer that has ever evolved”. Discuss.

Course Outcome 4 (CO4): Outline the concepts related to conventional and non-conventional energy

1. Suggest a sustainable system to generate hot water in a residential building in tropical climate.
2. Enumerate the impacts of biomass energy on the environment.

Course Outcome 5 (CO5): Demonstrate the broad perspective of sustainable practices by utilizing engineering knowledge and principles

1. Suggest suitable measures to make the conveyance facilities used by your institution sustainable.

Model Question paper

Part A

(Answer all questions. Each question carries 3 marks each)

1. Define sustainable development.
2. Write a short note on Millennium Development Goals.
3. Describe carbon credit.
4. Give an account of climate change and its effect on environment.
5. Describe biomimicry? Give two examples.
6. Explain the basic concept of Life Cycle Assessment.
7. Name three renewable energy sources.

8. Mention some of the disadvantages of wind energy.
9. Enlist some of the features of sustainable habitat.
10. Explain green engineering.

Part B

(Answer one question from each module. Each question carries 14 marks)

11. Discuss the evolution of the concept of sustainability. Comment on its relevance in the modern world.
OR
12. Explain Clean Development Mechanism.
13. Explain the common sources of water pollution and its harmful effects.
OR
14. Give an account of solid waste management in cities.
15. Explain the different steps involved in the conduct of Environmental Impact Assessment.
OR
16. Suggest some methods to create public awareness on environmental issues.
17. Comment on the statement, "Almost all energy that man uses comes from the Sun".
OR
18. Write notes on:
 - a. Land degradation due to water logging.
 - b. Over exploitation of water.
19. Discuss the elements related to sustainable urbanisation.
OR
20. Discuss any three methods by which you can increase energy efficiency in buildings.

Syllabus

Sustainability- need and concept, technology and sustainable development-Natural resources and their pollution, Carbon credits, Zero waste concept. Life Cycle Analysis, Environmental Impact Assessment studies, Sustainable habitat, Green buildings, green materials, Energy, Conventional and renewable sources, Sustainable urbanization, Industrial Ecology.

Module 1

Sustainability: Introduction, concept, evolution of the concept; Social, environmental and economic sustainability concepts; Sustainable development, Nexus between Technology and Sustainable development; Millennium Development Goals (MDGs) and Sustainable Development Goals (SDGs), Clean Development Mechanism (CDM).

Module 2

Environmental Pollution: Air Pollution and its effects, Water pollution and its sources, Zero waste concept and 3 R concepts in solid waste management; Greenhouse effect, Global warming, Climate change, Ozone layer depletion, Carbon credits, carbon trading and carbon foot print, legal provisions for environmental protection.

Module 3

Environmental management standards: ISO 14001:2015 frame work and benefits, Scope and goal of Life Cycle Analysis (LCA), Circular economy, Bio-mimicking, Environment Impact Assessment (EIA), Industrial ecology and industrial symbiosis.

Module 4

Resources and its utilisation: Basic concepts of Conventional and non-conventional energy, General idea about solar energy, Fuel cells, Wind energy, Small hydro plants, bio-fuels, Energy derived from oceans and Geothermal energy.

Module 5

Sustainability practices: Basic concept of sustainable habitat, Methods for increasing energy efficiency in buildings, Green Engineering, Sustainable Urbanisation, Sustainable cities, Sustainable transport.

Reference Books

1. Allen, D. T. and Shonnard, D. R., Sustainability Engineering: Concepts, Design and Case Studies, Prentice Hall.
2. Bradley. A.S; Adebayo,A.O., Maria, P. Engineering applications in sustainable design and development, Cengage learning
3. Environment Impact Assessment Guidelines, Notification of Government of India, 2006
4. Mackenthun, K.M., Basic Concepts in Environmental Management, Lewis Publication, London, 1998
5. ECBC Code 2007, Bureau of Energy Efficiency, New Delhi Bureau of Energy Efficiency Publications-Rating System, TERI Publications - GRIHA Rating System
6. Ni bin Chang, Systems Analysis for Sustainable Engineering: Theory and Applications, McGraw-Hill Professional.
7. Twidell, J. W. and Weir, A. D., Renewable Energy Resources, English Language Book Society (ELBS).
8. Purohit, S. S., Green Technology - An approach for sustainable environment, Agrobios Publication

Course Contents and Lecture Schedule

No	Topic	No. of Lectures
1	Sustainability	
1.1	Introduction, concept, evolution of the concept	1
1.2	Social, environmental and economic sustainability concepts	1
1.3	Sustainable development, Nexus between Technology and Sustainable development	1
1.4	Millennium Development Goals (MDGs) and Sustainable Development Goals (SDGs)	1
1.5	Clean Development Mechanism (CDM)	1
2	Environmental Pollution	
2.1	Air Pollution and its effects	1
2.2	Water pollution and its sources	1
2.3	Zero waste concept and 3 R concepts in solid waste management	1
2.4	Greenhouse effect, Global warming, Climate change, Ozone layer depletion	1
2.5	Carbon credits, carbon trading and carbon foot print.	1
2.6	Legal provisions for environmental protection.	1
3	Environmental management standards	
3.1	Environmental management standards	1
3.2	ISO 14001:2015 frame work and benefits	1
3.3	Scope and Goal of Life Cycle Analysis (LCA)	1
3.4	Circular economy, Bio-mimicking	1
3.5	Environment Impact Assessment (EIA)	1
3.6	Industrial Ecology, Industrial Symbiosis	1
4	Resources and its utilisation	
4.1	Basic concepts of Conventional and non-conventional energy	1
4.2	General idea about solar energy, Fuel cells	1
4.3	Wind energy, Small hydro plants, bio-fuels	1
4.4	Energy derived from oceans and Geothermal energy	1
5	Sustainability Practices	
5.1	Basic concept of sustainable habitat	1
5.2	Methods for increasing energy efficiency of buildings	1
5.3	Green Engineering	1
5.4	Sustainable Urbanisation, Sustainable cities, Sustainable transport	1

CET 385	SUSTAINABILITY ANALYSIS AND DESIGN	CATEGORY	L	T	P	CREDIT	Year of Introduction
		VAC	4	0	0	4	2019

Preamble: Goal of this course is to introduce various tools and techniques of sustainability analysis and its significance in design and engineering decision making.

Prerequisite: Nil

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

Course outcome identifier	Description of course outcome	Prescribed learning level
CO 1	Identify the impacts of various materials and processes on the biosphere	Remembering
CO2	Identify the parameters used in the calculation of sustainability	Understanding
CO 3	Estimate sustainability metrics for application-material combinations.	Applying
CO 4	Apply the design approaches by integrating sustainability concepts	Applying

Mapping of course outcomes with program outcomes (Minimum requirement)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	1	-	-	-	-	-	-	-	-	-	-	-
CO 2	1	2	-	-	-	-	-	-	-	-	-	-
CO 3	2	3	2	-	2	-	-	-	-	-	-	-
CO 4	2	3	2	-	2	-	-	-	-	-	-	-
CO5												

Assessment Pattern

Bloom's Category	Continuous Assessment Tests		End Semester Examination (Marks)
	Test 1 (Marks)	Test 2 (Marks)	
Remember	7.5	7.5	30
Understand	7.5	7.5	30
Apply	10	10	40
Analyse			

Evaluate			CIVIL ENGINEERING
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:

There will be two parts: Part A and Part B.

Part A contains 10 questions with 2 questions from each module and each question shall carry 3 marks. 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 Questions

Course Outcome 1 -Identify the impacts of various materials and processes on the biosphere.

1. How are materials classified as renewable and non-renewable?
2. Compare infinitely available and regenerative renewable resources.
3. Prepare a short description on zero waste production system.

Course Outcome 2 -Identify the parameters used in the calculation of sustainability

1. Compare "output pulled" and "input pushed" systems
2. Prepare short note on "dematerialization" and "remanufacturing".
3. Explain ecological footprint

Course Outcome 3 -Estimate sustainability metrics for application-material combinations

1. Illustrate the significance of biomimicry taxonomy in sustainable design.
2. How is global warning potential assessed?
3. Illustrate water foot print of a process.

Course Outcome 4 - Apply the design approaches by integrating sustainability concepts

1. Illustrate the role of biomimicry in the design for sustainability approaches.
2. Explain the significance of "cradle to cradle" design concept.

3. List any five commonly used life cycle impact categories

Syllabus

Module 1

Introduction to sustainability - Sustainable use of materials: Energy, ecology and natural resources

Engineering design process-Role of materials in design: important material characteristics, construction ecology and metabolism - specifications and market.

Module 2

Material flow analysis - efficiencies in mass flow — Constructing a material flowsystem—embodied energy—engineering models based on waste and materials management

Module 3

Sustainability metrics — mass balance and footprint concept Sustainable design - Specifications for sustainable material use — waste management and material life cycles - Environmentally sensitive design — Green engineering

Module 4

Life-cycle assessment—Life cycle assessment framework-Inventory analysis —impact assessment — interpretation

Module 5

Sustainable designs approaches - Sustainable urbanization – sustainable cities –sustainable transport - energy efficiency.

Text Books:

1. Allen,D.TandShornard,DR,SustainabilityEngineering,Concepts,DesignandCase Studies, Prentice Hall.
2. BradleyA.S.,Adebryo,A.O.,MariaP,EngineeringApplicationsinSustainableDesignand Development, Cengage Learning

References:

1. UNDP (1987), Our Common Future, Report of the World Commission on Environment and Development
2. Riley,D.R.,Thatche,C.E.,andWorkman,E.A.(2006),Developingandapplyinggreen building technology in an indigenous community: An engaged approach to sustainability education,InternationalJournalofSustainabilityinHigherEducation,7(2),142-157.
3. LSF-LST (2007). Understanding Sustainability, Learning for a Sustainable Future, <http://www.lsf1st.cz/en/teachers/understanding.php>,YorkUniversity,Ontario,Canada.
4. ASCE (2004), Sustainable Engineering Practice: An Introduction, Jorge A. Vanegas(Editor).

5. USGBC (2008), LEEA Rating Systems, US Green Building Council, <http://www.usgbc.org/DisplayPage.aspx?CMSPageID=222>(2008), Thematic Strategy on the prevention and recycling of waste, The European Commission, <http://ec.europa.eu/environment/waste/index.htm>

Course Contents and Lecture Schedule:

No.	Topic	Course Outcome	No. of Hrs
1	Module 1		Total: 9
1.1	Introduction to sustainability - Sustainable use of materials	CO1, CO2	2
1.2	Energy, ecology and natural resources	CO1, CO2	3
1.3	Engineering design process-Role of materials in design	CO1, CO2	2
1.4	Construction ecology and metabolism - specifications and market	CO1, CO2	2
2	Module 2		Total: 9
2.1	Material flow analysis - efficiencies in mass flow	CO1, CO2 CO3	3
2.2	Constructing a material flow system—embodied energy	CO1, CO2 CO3	3
2.3	Embodied energy	CO2, CO3	1
2.4	Engineering models based on waste and materials management	CO2, CO3	2
3	Module 3		Total: 9
3.1	Sustainability metrics — mass balance and footprint concept Sustainable design	CO1, CO2 CO3, CO4	2
3.2	Specifications for sustainable material use	CO1, CO2 CO3, CO4	3
3.3	Waste management and material life cycles	CO3, CO4	2
3.4	Environmentally sensitive design — Green engineering	CO3, CO4	2
4	Module 4		Total: 9
4.1	Life-cycle assessment—Life cycle assessment framework	CO1, CO2 CO3, CO4	3
4.2	Inventory analysis	CO1, CO2 CO3, CO4	3
4.3	Impact assessment – interpretation	CO1, CO2 CO3, CO4	3
5	Module 5		Total: 9
5.1	Sustainable design approaches	CO1, CO2 CO3, CO4	3
5.2	Sustainable urbanization – sustainable cities	CO1, CO2 CO3, CO4	3
5.3	Sustainable transport - energy efficiency.	CO3, CO4	3

QP CODE:

Reg No.: _____

Name: _____

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

Course Code: CET 385

Course Name: SUSTAINABILITY ANALYSIS AND DESIGN

Max. Marks: 100

Duration: 3 hours

Answer All Questions- 10 ×3 =30marks

Each question carries 3marks

1. Narrate any one material characteristic that is needed to ensure sustainability.
2. Highlight any one approach that could enable products in the market to be preferred on environmental performance.
3. State any one of the observation from material flow analysis that would supplement sustainability evaluation.
4. What is embodied energy of a material?
5. Define footprint based sustainability indicators.
6. Illustrate the term "Reuse factor"
7. Additive operations in LCA.
8. LCA helps to arrive at lower entropy form of a material. Substantiate the statement giving any one reason.
9. Prepare a short account on sustainable urbanization
10. How is energy efficiency linked with sustainable design process.

PART B

Each question carries 14marks

11. Identify any three engineering materials that are used as environmental substitutes for the conventional systems. Also narrate the factors considered in their selection based on engineering design requirement.

or

12. Explore the possibility of creating ecosystem based approach for construction process and highlight its significance to ensure sustainability.

13. "Buildings embody large quantity of material energy". Prepare a short description narrating how this resource could be used to create energy efficient material use road map for Kerala.

or

14. Establish the industrial ecological model as an outcome of engineering models proposed for waste and material management.

15. Explore the possibility of creating ecosystem based approach for construction process and highlight its significance to ensure sustainability. Case based justification is expected.

or

16. Explain a few interventions incorporated as part of design for environment concept for improving the material handling process.

17. Explain the four major steps involved in the LCA programme.

or

18. (i) List any two challenges faced while implementing the LCA for an impact assessment programme.

(ii) Justify ,giving two reasons, how LCA enables to take environmentally informed decisions

