



SEMESTER -3

| | | | | | | |
|-----------------------|--------------------------------|-----------------|----------|----------|----------|---------------|
| 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 |

| 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 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

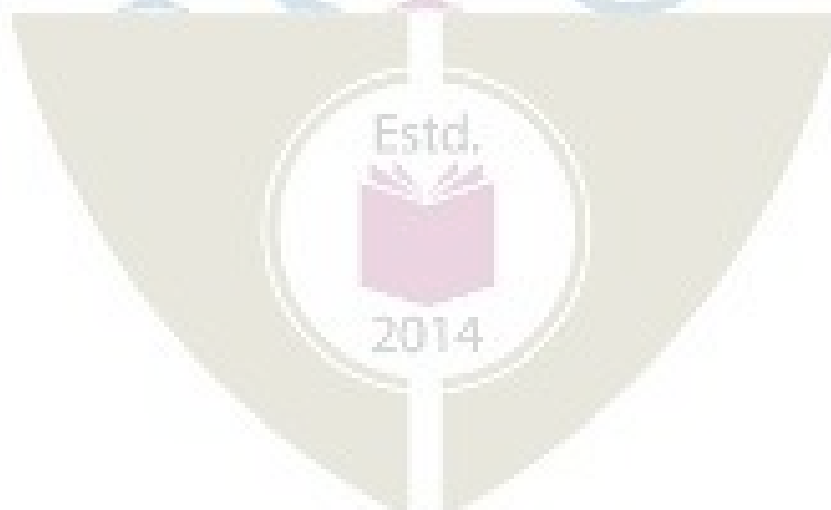
- 1.Philip Kosky, Robert Balmer, William Keat, George Wise, Exploring Engineering, Fourth Edition: An Introduction to Engineering and Design, Academic Press 2015, 4th Edition, ISBN: 9780128012420.
2. Clive L. Dym, Engineering Design: A Project-Based Introduction, John Wiley & Sons, New York 2009, Fourth 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-: Detailing Customer Requirements.</i> <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-: Setting Design Objectives, Identifying Constraints, Establishing Functions.</i> <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-: Generating Design Alternatives and Choosing a Design.</i> <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 | | |



| 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 Fleddermann, 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 25 |
|--------------|---|-------------------------------------|
| 1 | Module 1 – Human Values. | |
| 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 |



SEMESTER -4

| 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 | 2 |
| 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 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-: Detailing Customer Requirements.</i> <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-: Setting Design Objectives, Identifying Constraints, Establishing Functions.</i> <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-: Generating Design Alternatives and Choosing a Design.</i> <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 | | |



| 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 Fleddermann, 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 25 |
|--------------|---|-------------------------------------|
| 1 | Module 1 – Human Values. | |
| 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 |