

## Course Syllabi: UTA010 Engineering Design-II (L : T : P :: 1 : 0 : 2)

1. **Course number and name:** UTA0101 Engineering Design-II
2. **Credits and contact hours:** 3 and 5.0
3. **Text book, title, author, and year**

### **Text Books / Reference Books**

- *Michael McRoberts, Beginning Arduino, Technology in action publications.*
  - *Alan G. Smith, Introduction to Arduino: a piece of cake, CreateSpace Independent Publishing Platform (2011)*
- a. Other supplemental materials
    - Nil

### **4. Specific course information**

- a. Brief description of the content of the course (catalog description)

### **Breakup of lecture details to be taken up by MED:**

<b>Lec No.</b>	<b>Topic</b>	<b>Contents</b>
Lec 1	Introduction	The Mangonel Project History.
Lec 2	CDIO	Conceive Design Implement and Operate.
Lec 3	Manufacturing	Manufacturing and assembling the Mangonel.
Lec 4		
Lec 5	Materials	How to choose the right material
Lec 6	Modelling	The role of modelling in Engineering Design
Lec 7	Structures	Why things fail?
Lec 8	Dynamics	Dynamics of the Mangonel
Lec 9	Structures	Designing against structural failure
Lec 10	Kinematics/Software Modelling	Simulation as an Analysis Tool in Engineering Design

### **Breakup of lecture details to be taken up by ECED:**

<b>Lec No.</b>	<b>Topic</b>	<b>Contents</b>
Lec 11-15	Digital Electronics	Prototype, Architecture, Using the Integrated Development Environment (IDE) to Prepare an Arduino Sketch, Structuring an Arduino Program, Using Simple Primitive Types (Variables), Simple programming examples. Definition of a sensor and actuator.

### **Laboratory Work:**

Associated Laboratory/Project Programme:

#### **Laboratory Title**

Dynamics of Mangonel - No Drag

#### **Code**

L1

Dynamics of Mangonel - with Drag	L2
Design against failure under static actions	L3
Design against failure under dynamic actions	L4
Simulation	L5
Manufacturing components of the Mangonel	L6
Manufacturing components of the Mangonel	L7
Manufacturing components of the Mangonel	L8
Manufacturing components of the Mangonel	L9
Assembly of Mangonel	L10
Spring Test of Mangonel	L11
Distance Test of Mangonel	L12
Speed Test of Mangonel	L13
Mangonel redesign for competition	L14
Competition	L15

### 5. Specific goals for the course

After the completion of the course, the students will be able to:

- Model trajectories of masses with and without aerodynamic drag.
- Develop a software tool to allow trajectories be optimized.
- Analyse the static and dynamic stresses of elements of an engineering mechanism.
- Optimally design structural elements of an engineering mechanism.
- Perform a test to acquire an engineering material property.
- Develop and test software code to process sensor data.
- Design and construct and test an electronic hardware solution to process sensor data.
- Construct a roman catapult “mangonel” using tools, materials and assembly instructions.
- Operate and evaluate the “mangonel” for functional and structural performance.
- Validate theoretical models by comparison with experiments.
- Integrate skills to innovatively redesign an element of the “mangonel”.
- Participate and cooperate in a team.